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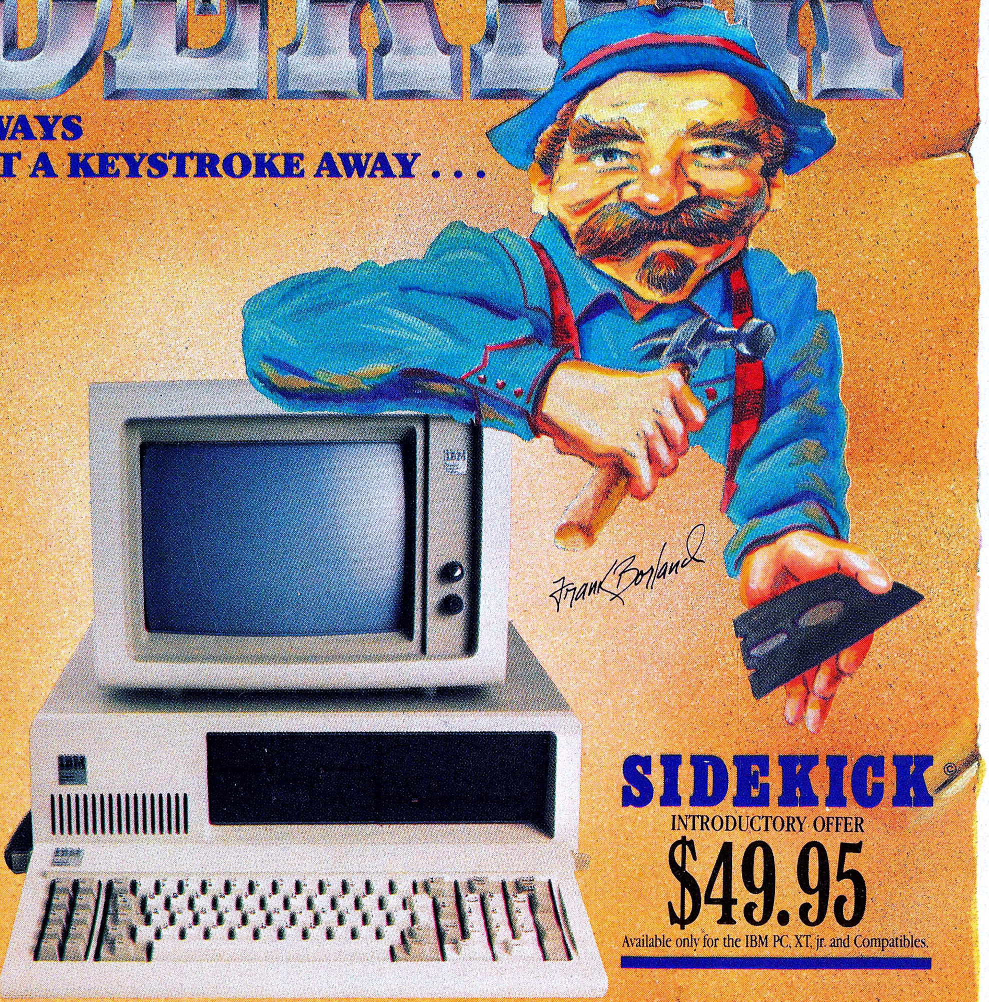

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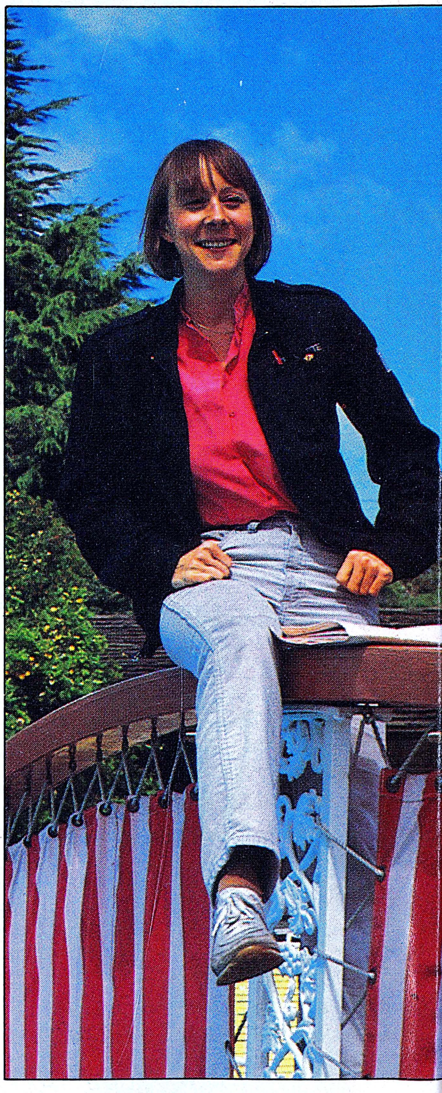

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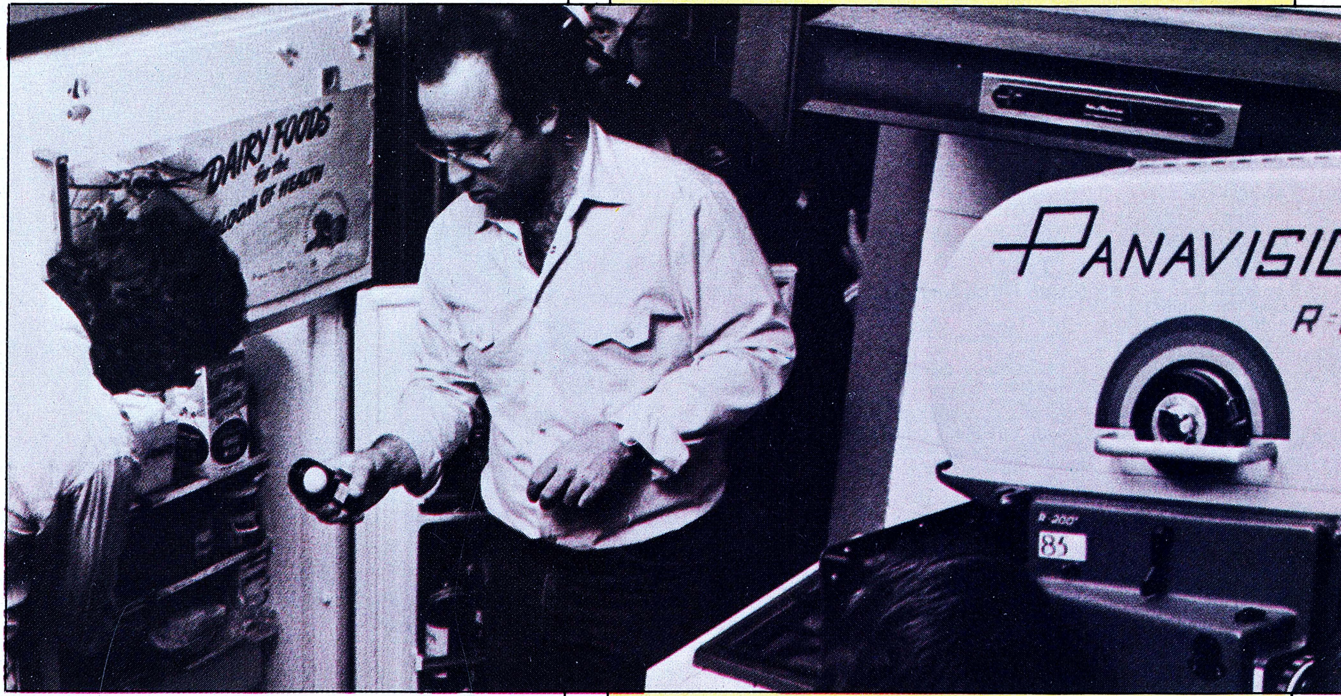

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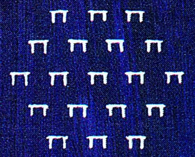
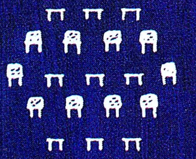
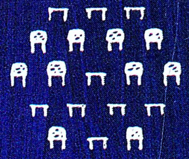
The Living Desert Contest

With capital obtained from a large overseas order for the popular game *Boron Moron,* Death Valley Development Corporation has constructed a top-secret software development center just outside Desert Center, California. The building is supposed to be a refuge for the company's nineteen brightest, flightiest programmers. These temperamental individuals can't concentrate amid the hustle and bustle of town—tourists are continually pulling into the gas station. The nerve center of the new facility is an ergonomically designed hexagonal workroom where the company plans to install ten PCs and nine PC*jrs*. The room's nineteen workbenches are arranged thus:



The company has determined that, for the sake of more efficient networking, the computers must be arranged in such a way that no row in any of three directions contains an odd number of PCs. How the Juniors are arranged is deemed unimportant. The following two plans are proposed:





However, the programmers, for whom the center has been built, won't cooperate. They are nonconformist, anarchic coders who disdain top-down, structured programming and insist that comment statements are for sissies. Many are mountain climbers, and a few used to be Buddhist monks. They want no part of such blatant symmetry, claiming that their inspiration will be dampened by the oppressive geometry. They insist on an asymmetric arrangement of computers, such that you couldn't draw a straight line to divide the room into two halves that mirror one another.

After a heated management-employee conference, the company agrees to let the programmers have their asymmetric layout, lest there be nineteen nervous breakdowns. The only catch is that the programmers must adhere to the rule that no row in any of three directions may contain an odd number of PCs. The programmers are confident that they'll find such an arrangement.

Can they really? If you think so, diagram the arrangement clearly on a (preferably picturesque) post card and send it to Cactus Flower, Softalk for the IBM PC, Box 7040, North Hollywood, CA 91605—by September 15. The prize is $100 worth of software chosen from the advertisers in this issue (don't worry, Death Valley Development doesn't advertise). If more than one interior decorator comes up with the right layout, we'll rely on our trusty random number generator to pluck the winner from obscurity. And don't enter more than once unless you're a postage fetishist. (Are you listening, Arlington, TX?)

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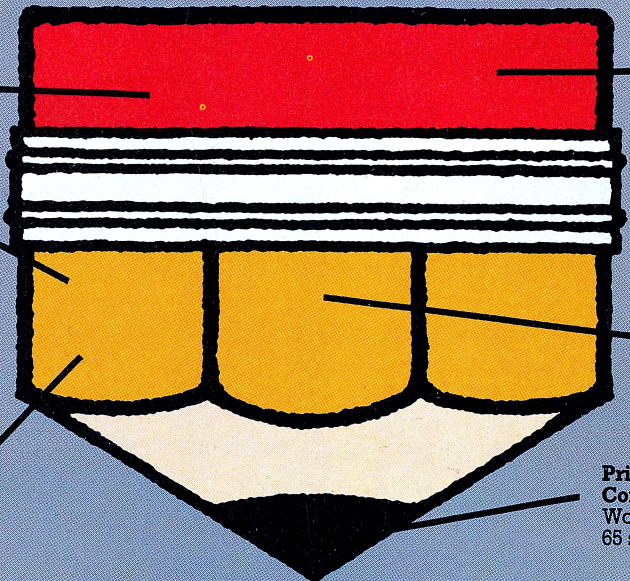

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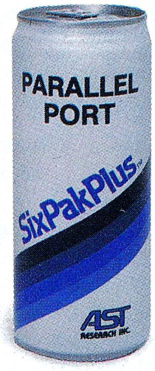
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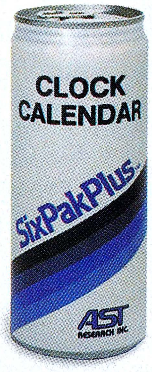
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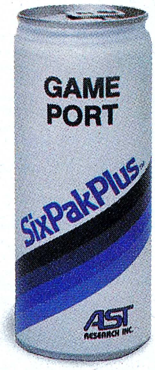
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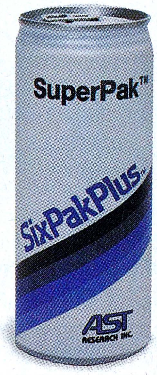
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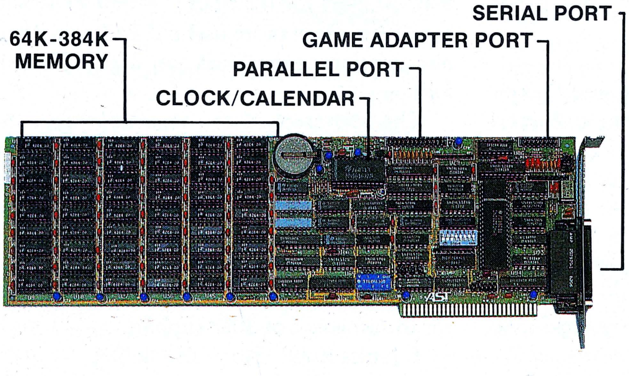
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Dec. '83, p 22

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CROSSTALK

Re-View Review

The June "Public Library" in *Softalk for the IBM PC* compares my program *Re-View* with two replacements for the DOS *type* command.

Re-View is not a *type* command of any kind. Rather, it's a resident system utility that provides bidirectional, hardware scrolling of the output of any program that writes to the screen using the standard DOS or BIOS interrupts. This includes Basic listings, the output of DOS utilities (*tree, dir, comp, type,* Edlin, Debug, and so on), and the output of many commercial and public domain programs.

For example, the listing of a large directory may scroll some information off the top of the screen. With *Re-View,* the lost information may easily be scrolled back onto the screen.

Re-View provides other features, including an improved pause function, reduced flicker during normal scrolling, and the ability to view the output of one program from within another. For example, you can flip to your commented source code while stepping through the executable code in Debug.

Hardware scrolling, while virtually instantaneous and flicker-free, does impose limitations. *Re-View* operates only with the color/graphics adapter, which has sufficient onboard memory for 100 lines of eighty-column text. Also, *Re-View* doesn't scroll text from programs that bypass the DOS and BIOS screen routines, such as the IBM *Personal Editor.*

I see nothing odd, as Mr. Ford did, about requesting a modest fee from *Re-View* users while giving other programs away. *Re-View* was much more challenging and time-consuming to develop than the relatively simple sixteen-color graphics game *Bricks* or the half-dozen or so utilities I contributed to the public domain. Moreover, *Re-View* provides a unique set of capabilities unavailable—to the best of my knowledge—from any other source.

Vincent Bly, Ft. Belvoir, VA

Nelson Ford replies: *I must apologize to Vincent Bly.* Re-View *is indeed a unique and useful utility. Bly's utility arrived at the same time as* Super Typer *and* List, *which are, as Bly points out, utilities used in the place of the DOS* type *command to scroll through files in both directions by using large memory buffers to hold the screens. In reading Bly's documentation, I keyed on the words "scrolling," "listings," and "75-line buffer," and mistakenly dismissed* Re-View *as another file scroller with the others' capacity. Unfortunately, such an oversight (rare, I hope) is an occupational hazard of reviewing hundreds of public domain programs a month. Having gone back and examined* Re-View *from the right perspective, I'm impressed with what it does. It's definitely being added to my Autoexec.bat file. And, Mr. Bly, my check is on its way.*

The 8087: Fact or Fiction?

In response to June's "The Analytical Engine" on 8087 support for the Basic compiler, I'd like to note that there are two ways to use the 8087 numeric coprocessor that involve much less effort and offer comparable performance. The APL notation as implemented for the PC by three vendors offers automatic use of the 8087 chip.

One implementation (by IBM) requires the 8087 numeric processor, while two others (STSC APL Plus/PC and Watcom APL) automatically use the 8087 if present in the machine. All three implementations offer performance similar to compiled languages with 8087 run-time support systems. These execution time figures for the examples Ed Bogucz compiled (in seconds) include the time taken by the APL system to interpret the expressions that compute the benchmarks.

	IBM	**STC**	**Watcom**
20-by-20 matrix multiplication	8.4	8.23	16.76
2,100 logarithms	1.48	1.43	2.47

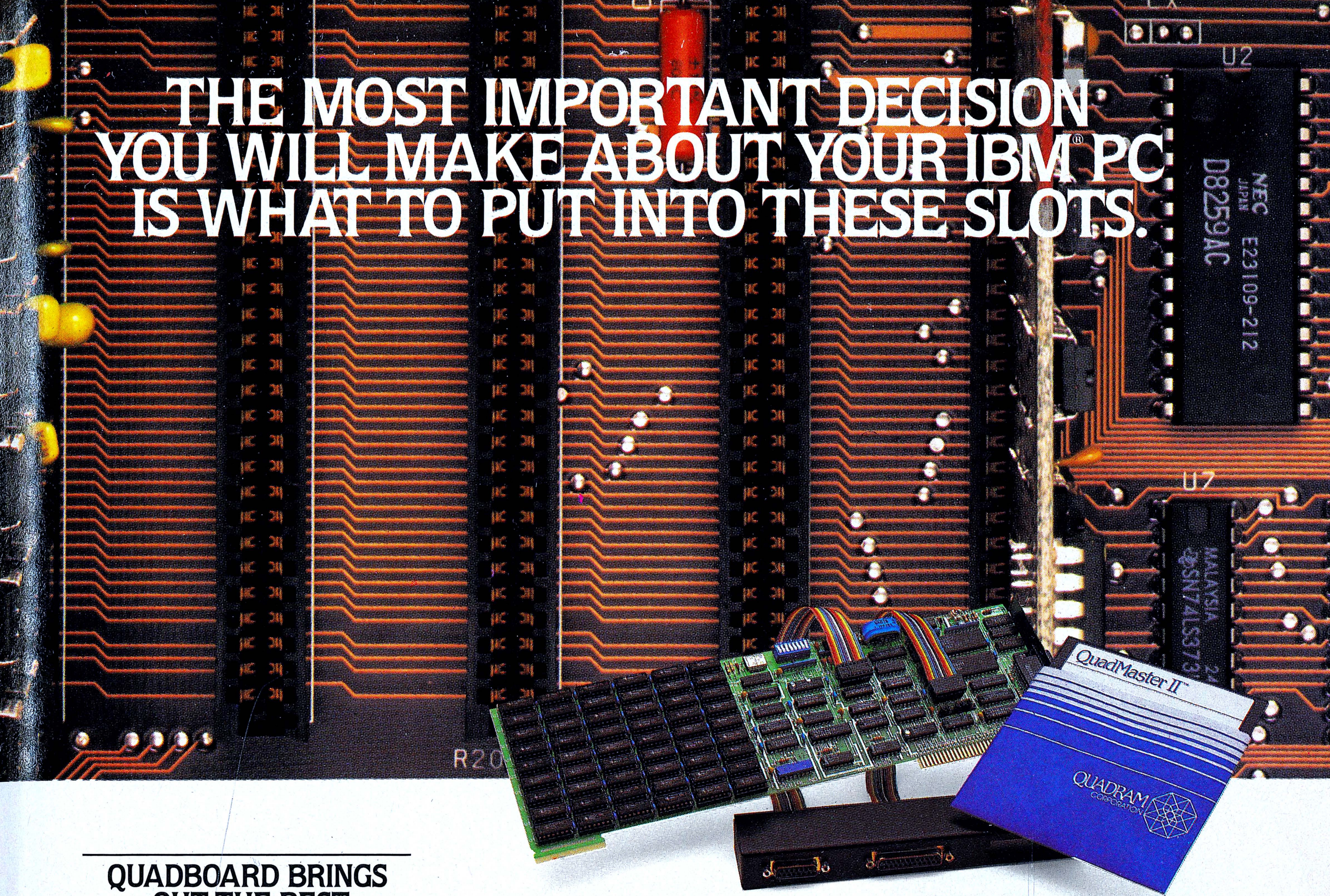
APL offers significant advantages in programming ease and productivity, in comparison with Basic, C, Pascal, and so on, with very little penalty in performance.

John E. Howland, Ph.D., San Antonio, TX

May's "The Analytical Engine" dealing with 8087 support for the macro assembler would have been much more useful if Ed Bogucz had also considered the Microsoft *Macro Assembler.*

The Microsoft *Macro Assembler* and the IBM version 1 assembler are not the same product; the Microsoft 1.25 assembler directly supports the 8087 with no need for preprocessors or macro libraries. The various products reviewed are now largely irrelevant since they are mostly stopgap measures to compensate for the omission of 8087 support.

F. James Rohlf, Stony Brook, NY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Ed Bogucz replies: *The market for products that support that 8087 has evolved faster than many observers (including this one) expected.*

Microsoft released its assembler, which included 8087 support, after I researched May's "The Analytical Engine." In addition, Intel's Asm86, which runs under PC-DOS, is now available from Genesis Microsystems (196 Castro Street, Mountain View, CA 94041). I learned of these products after the publication deadline, and the article was somewhat outdated when it appeared. Nevertheless, the products reviewed are not wholly irrelevant: Individuals who own the IBM version 1 assembler and want 8087 support without the expense of a new assembler may well consider the products I discussed in May. Of course, this alternative is attractive only if the price is right; price reductions for the products reviewed seem necessary in light of the reasonable cost of Microsoft's assembler. A future installment of "The Analytical Engine" will review the new assemblers that support the 8087 directly.

Hot Disks

The January "Q&A" discusses a question from a reader whose dual-sided disk drives decided unilaterally to become single-sided. I too had this problem. Even returning the drive for a replacement wasn't the answer.

The problem always occurred after using the computer for a couple of hours. It went away after I turned it off for a while. That suggested the cause: heat.

Source? I had an Amdek 300 sitting right on the computer, right over the drive boards, which are on top, as we know. The Amdek doesn't have legs but a skirt that extends down to the surface it sits on—creating a pocket of great heat! Setting the monitor up on small inch-high stilts solved the problem.

John R. McGinley, Jr., Wilton, CT

Contest Contention

It would appear that John Mudd of Casselberry, Florida, got one past you with his contest suggestion to come up with a Basic program that creates an exact ASCII copy of itself ("Crosstalk" June 1984).

His proposed problem is trivial. If you read the IBM Basic Manual, you'll find that *List,file spec* will write an ASCII file with a listing of a Basic program. Also, *list* works as a statement in a program (although this bit of information is not well documented).

So, to solve the problem, just make the last statement in your program *List,filespec*. Then run the program. If *filespec* is omitted, the listing will be written to the screen.

Keep up the good work. I enjoy your magazine and have learned many things from it.

Robert H. Biles, Anaheim, CA

I wanted to write a note in support of your fevered, brilliant contest author, who, poor tortured soul, has to keep up with the PC*jr*-compatible industry. The WeePC indeed! (See June's contest.)

Although I don't really understand that much about the PC—even though I use one all the time—I get a kick out of looking through *Softalk* when it arrives at the office every month. The contest is always something I can grasp and enjoy.

Tracy Duke, Philadelphia, PA

I trust my patch (June 1984) to modify the Tandon drive step rate proved useful to your readers. However, I should point out that you erred in transcribing my letter. All references to microseconds should in fact be milliseconds. We would have quite a system if we could step our driveheads at four microseconds! I also forgot to mention that you should reboot the system with control-alt-delete after patching the disk.

Further, I'd like to reassure those who may think this patch could damage their drives. I chose a step rate of four milliseconds because it's the fastest you can run the drives and yet stay close to the actual optimum rate of five milliseconds for Tandon double-density dou-

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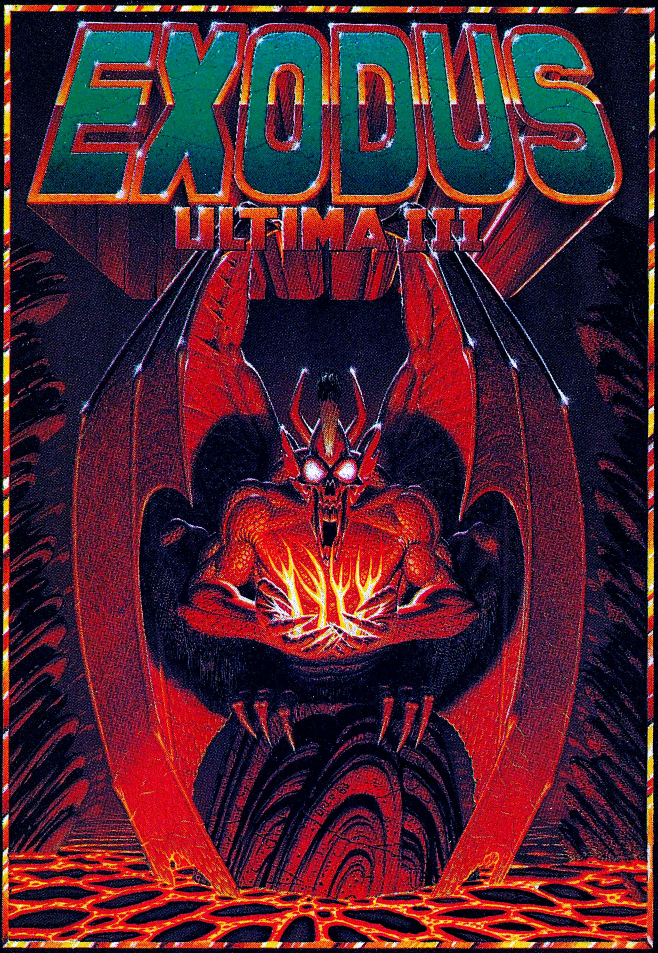

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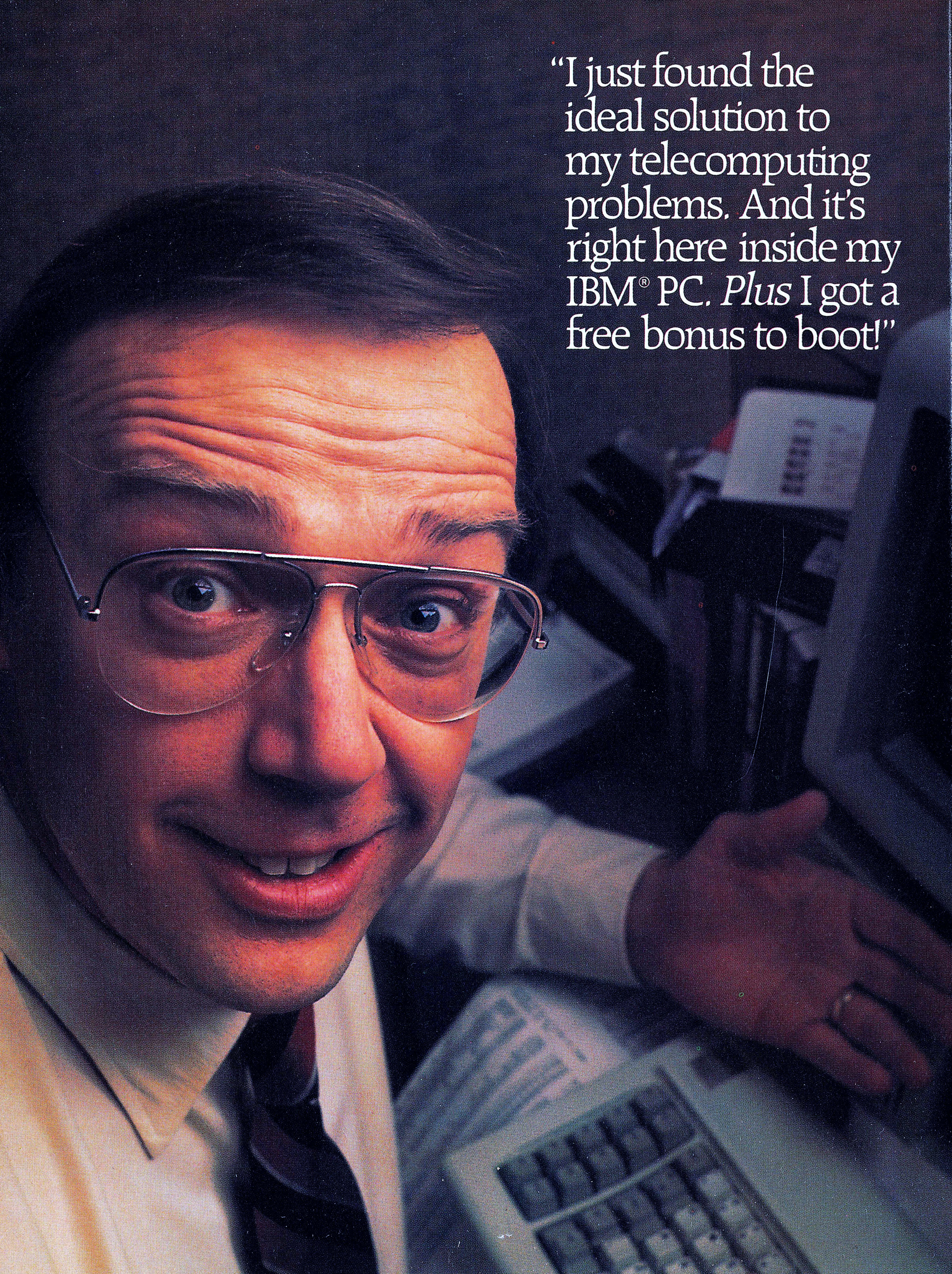
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ble-sided drives (it seems the PC allows only multiples of two milliseconds). I have operated my drives at this step rate for over six months with no adverse effects. In fact, I believe the reduced vibration is quite beneficial to drive operation. The original step rate chosen for the PC was probably a result of the typically conservative IBM design philosophy.

Fulvio Castelli, Montreal, Quebec

S-a-a-a-a-a-n-y-o

I'd like to pass on some information about interfacing a Sanyo model DMC 6113 RGB monitor to a PC—a problem somewhat similar to interfacing a Sony Profeel monitor (see the letter from Dr. Malladi Subbaiah in "Crosstalk," August 1983).

The DMC 6113's factory settings for the vertical and horizontal synchronization drives are composite and negative, and there is no polarity for the cursor. The PC's color/graphics adapter requires that all three signals be positive. Thus, minor modifications must be made to the monitor.

Remove the monitor's back and keep the monitor facing away from you. In the upper left corner of the components board you'll find a plastic plug with three wires attached—a red one, a green one, and a blue one. These are the RGB input signals, and they should be properly set to positive. Below and to the right of the three-wire plug (toward you) is a single-wire plug that has *ho:mix-sync* inscribed below it on the components board. This plug is for the horizontal drive signal and can be placed on either the left (labeled *nega* for negative) or right (labeled *posi* for positive) pin of its pin pair. Place the plug on the right pin. Above the horizontal drive plug are two plugs that are each placed on the farthest pin of a three-pin set. Respectively, these are the vertical synchronization and cursor inputs. Each plug should be placed on the middle pin of its respective set so that it will accept positive signal inputs. Replace the monitor's back cover and attach the interface cable. The monitor is now ready to use.

The Sanyo DMC 6113 is an inexpensive, fairly good monitor when properly set up.

Paul Marsh, Raleigh, NC

CONTEST WINNERS

E.W. Peetz of Falls Church, Virginia, did not win the PCwick Papers contest from May 1984. He or she did, however, contribute an illuminating thought from *Oliver Twist*: "There is a passion for hunting something deeply implanted in the human breast." Sorry E.W., although you had all the correct answers, the random number generator doesn't give extra credit for illuminating thoughts.

Herewith, then, is the complete list of literary twists.

1. "I wants to make your flesh creep."—*Pickwick Papers*
2. "There is some credit in being jolly."—*Martin Chuzzlewit*
3. "'I am ruminating,' said Mr. Pickwick, 'on the strange mutability of human affairs.'"—*Pickwick Papers*
4. "Oliver Twist has asked for more!"—*Oliver Twist*
5. "It is a melancholy truth that even great men have their poor relations."—*Bleak House*
6. "Chapter I: I Am Born"—*David Copperfield*
7. "It was the best of times, it was the worst of times."— *A Tale of Two Cities*
8. "Get hold of portable property"—*Great Expectations*
9. "Now, what I want, is Facts . . . Facts alone are wanted in life."—*Hard Times*
10. "We are so very 'umble."—*David Copperfield*
11. "Here's richness!"—*Nicholas Nickleby*
12. "Something will come of this. I hope it mayn't be human gore."—*Barnaby Rudge*
13. "Here's the rule for bargains: 'Do other men, for they would do you.'"—*Martin Chuzzlewit*
14. "May we never want a friend in need, nor a bottle to give him!"—*Dombey and Son*
15. "God bless us every one!"—*A Christmas Carol*

Only a handful of entrants correctly identified every quote, the most missed being from *Great Expectations*. Most of you recognized the phrase about happy families as being from Tolstoy's *Anna Karenina* (a great novel but not part of the contest), although some of you claimed Dickens penned it in *David Copperfield, Oliver Twist*, or *Martin Chuzzlewit*.

Then there was Thomas J. Roberts of Storrs, Connecticut, who recognized a "*he* from *Edwin Drood* (Chapter 3), a *the* from *The Old Curiosity Shop* (Chapter 1), and a *they* from *Our Mutual Friend* (Chapter 2). (A *that* on page 134 looks very much like a *that* Dickens used in *Little Dorrit*, Chapter 5, but close examination proved that it is a *that* taken from Thackeray's *Vanity Fair*, Chapter 1.)"

So who did win this demnition contest? Joan Davis of Owego, New York. She not only identified every work but also spelled them all correctly. As the immortal Sam Weller said, "That 'ere young lady, she knows wot's wot, she does." ▲

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QUESTIONS & ANSWERS

by Nancy Andrews

You've finally done it. At least 30 percent of you have asked questions about how to make DOS calls from within Basic programs. This month we had two such queries—one to read the volume label from a disk, the other to read the date a file was created.

Each time we've had a question like this, we've written a program to answer the specific problem. But you've finally pushed us too far—now we've written *The Generic Interrupt Caller.* This program works only with DOS 2; you could modify it to work with DOS 1.1, but it would take some work.

With *The Generic Interrupt Caller* you can make calls to interrupts 10H, 11H, 12H, 13H, 14H, 15H, 16H, 17H, 21H, 25H, and 26H from Basic. In fact, you can call most any interrupt you'd ever want to use (to be more specific—any interrupt that uses AX, BX, CX, DX, or DS).

The sample program below, named Dir.bas, uses *The Generic Interrupt Caller* (hereafter to be called the GIC) to call interrupt 21H and print a complete directory.

```
100 DEF FNW!(X) = PEEK(X) + 256 * PEEK(X + 1)
110 DEF FNWORD%(X) = VAL("&h" + HEX$(FNW!(X)))
130 GOSUB 1012
180 '-----------------------------------
```

```
190 GOSUB 300 : PATH$ = "*.*" : ATTR = -1 : GOSUB 400 : GOSUB 300
200 PRINT : GOSUB 870
210 WHILE ER% = 0 : GOSUB 550 : GOSUB 870 : WEND
220 END
230 '
290 '---------------------------------
300 DEF FNH$(X) = RIGHT$("0000" + HEX$(X),4)
310 PRINT "AX =";FNH$(AX%);" ";
320 PRINT "BX =";FNH$(BX%);" ";
330 PRINT "CX =";FNH$(CX%);" ";
340 PRINT "DX =";FNH$(DX%);" ";
350 PRINT "DS =";FNH$(DS%);" ";
360 PRINT "FL =";FNH$(FL%);" ";
370 PRINT : RETURN
380 '
390 '---------------------------------
400 '-----------------------------------
410 '   Get 1st matching directory entry
420 '      input:  PATH$, ATTR
430 '      output: BUFFER$
440 '              SIZE!,YEAR%,MONTH%,DAY%,HOUR%,MINUTE%,SECOND%,NAME$,ER$
450 '
460 BUFFER$ = STRING$(43,0)
470 PATH$ = PATH$ + CHR$(0)
480 MID$(BUFFER$,31,13) = STRING$(13,32)
490 BUFFERPTR% = FNWORD%(VARPTR(BUFFER$) + 1)
500 PATHPTR%  = FNWORD%(VARPTR(PATH$) + 1)
510 AX% = &H1A00 : DX% = BUFFERPTR% : DS% = 0 : INTNUM% = 33 : GOSUB 1007
520 AX% = &H4E00 : DX% = PATHPTR% : CX% = ATTR : DS% = 0 : GOSUB 1007
530 GOSUB 690
540 RETURN
550 '-----------------------------------
560 '   Get Next matching directory entry
570 '      input:  BUFFER$ undisturbed!
580 '      output: SIZE!,YEAR%,MONTH%,DAY%,HOUR%,MINUTE%,SECOND%,NAME$,ER$
590 '
600 MID$(BUFFER$,31,13) = STRING$(13,32)
610 BUFFERPTR% = FNWORD%(VARPTR(BUFFER$) + 1)
620 AX% = &H1A00 : DX% = BUFFERPTR% : DS% = 0 : GOSUB 1007
630 AX% = &H4F00 : GOSUB 1007
640 GOSUB 690
650 RETURN
660 '-----------------------------------
680 '---------------------------------
690 '---------------------------------
700 ' Decode BUFFER$ into Date, Time, etc.
710 '
720 '      input:  BUFFER$
730 '      output: SIZE!,YEAR%,MONTH%,DAY%,HOUR%,MINUTE%,SECOND%,NAME$.ER$
740 '
750 NAM$ = MID$(BUFFER$,31,13)
760 SIZE! = 0
765 FOR I = 30 TO 27 STEP -1 : SIZE! = SIZE! * 256 + ASC(MID$(BUFFER$,I,1)) : NEXT I
770 TIM% = CVI(MID$(BUFFER$,23,2))
780 SECOND% = 2 * (TIM% AND 31)
790 MINUTE% = (TIM% \ 32) AND 63
800 HOUR% = (TIM% \ 2048) AND 31
810 DAT% = CVI(MID$(BUFFER$,25,2))
820 DAY% = (DAT% AND 31)
830 MONTH% = (DAT% \ 32) AND &HF
840 YEAR% = ((DAT% \ 512) AND &H7F) + 1980
850 ER% = AX%
860 RETURN
870 '----------------------------------------
880 '
890 PRINT NAM$,MONTH%"/"DAY%"/"YEAR%;"   "HOUR%" : "MINUTE%" : "SECOND%,SIZE!"bytes
900 RETURN
1000 REM ****************************************
1001 REM ----------------------------------------
1002 REM Generic Interrupt Caller
1003 REM
1004 REM ------------------------------
1005 REM --- GOSUB to here to call the machine language routine
1006 REM
1007 V = VARPTR(INTERRUPT$)
1008 INTERRUPT! = PEEK(V + 1) + 256 * PEEK(V + 2)
1009 CALL INTERRUPT!(INTNUM%,AX%,BX%,CX%,DX%,DS%,FL%)
1010 RETURN
1011 REM ------------------------------
1012 REM --- Read the machine code into INTERRUPT$:
```

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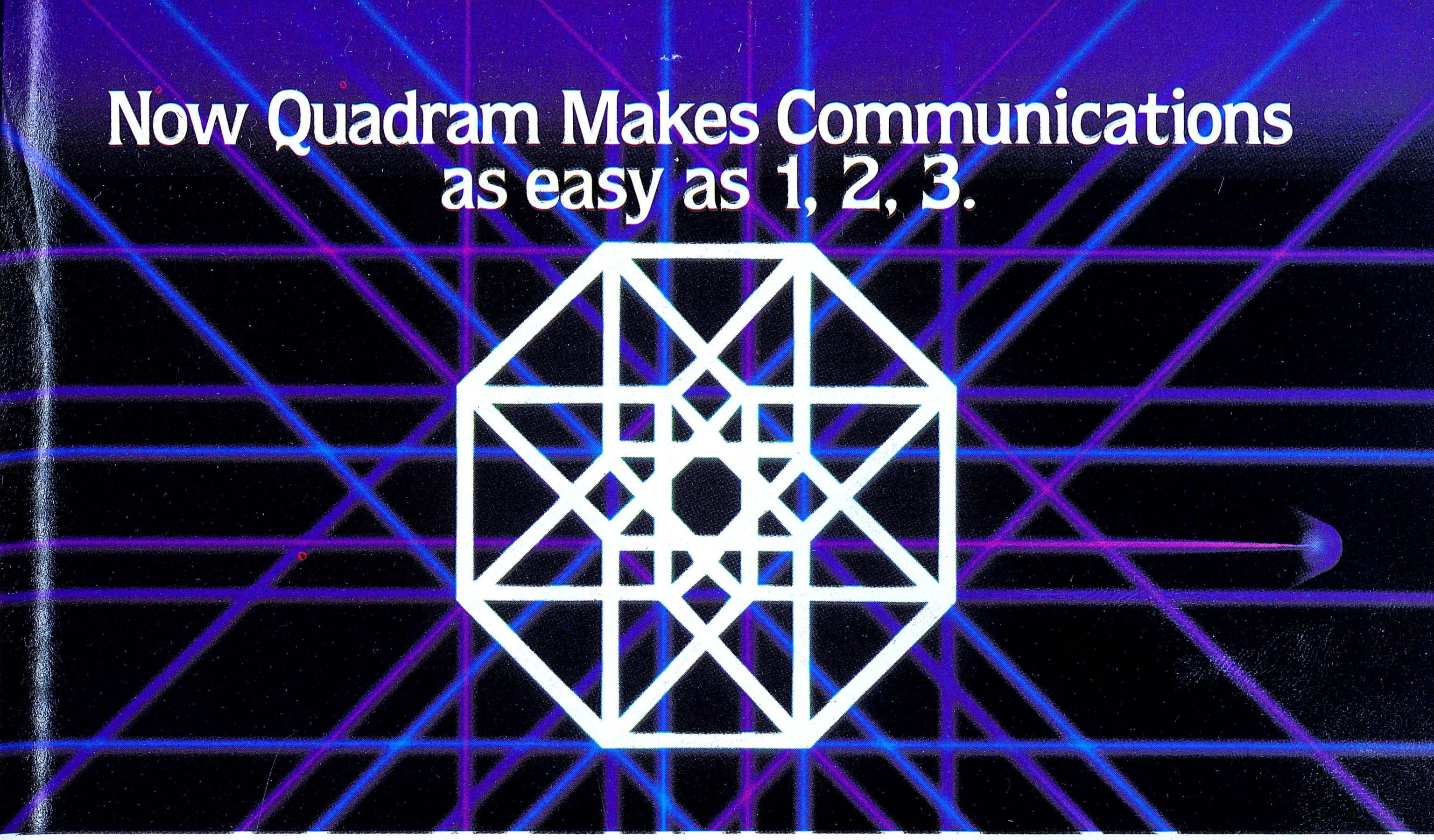

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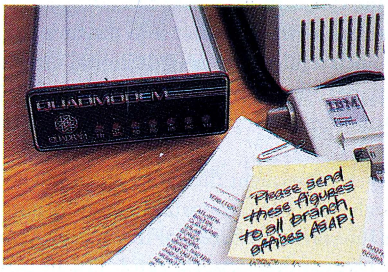

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```
1013 REM
1014 RESTORE 1019 : READ NBYTES : INTERRUPT$ = ""
1015 FOR I = 1 TO NBYTES
1016   READ N : INTERRUPT$ = INTERRUPT$ + CHR$(N)
1017 NEXT I
1018 RETURN
1019 DATA 190
1020 DATA 144, 139, 236,  30, 139, 118,  14,  38
1021 DATA 139,   4, 139, 118,  12,  38, 139,  28
1022 DATA 139, 118,  10,  38, 139,  12, 139, 118
1023 DATA   8,  38, 139,  20, 139, 118,   6,  38
1024 DATA 131,  60,   0, 116,   3,  38, 142,  28
1025 DATA 139, 118,  16,  38, 139,  52, 131, 254
1026 DATA  16, 117,   4, 205,  16, 235,  90, 131
1027 DATA 254,  17, 117,   4, 205,  17, 235,  81
1028 DATA 131, 254,  18, 117,   4, 205,  18, 235
1029 DATA  72, 131, 254,  19, 117,   4, 205,  19
1030 DATA 235,  63, 131, 254,  20, 117,   4, 205
1031 DATA  20, 235,  54, 131, 254,  21, 117,   4
1032 DATA 205,  21, 235,  45, 131, 254,  22, 117
1033 DATA   4, 205,  22, 235,  36, 131, 254,  23
1034 DATA 117,   4, 205,  23, 235,  27, 131, 254
1035 DATA  33, 117,   4, 205,  33, 235,  18, 131
1036 DATA 254,  37, 117,   4, 205,  37, 235,   9
1037 DATA 131, 254,  38, 117,   4, 205,  38, 235
1038 DATA   0, 139, 118,  14,  38, 137,   4, 159
1039 DATA 176,   0, 134, 224, 139, 118,   4,  38
1040 DATA 137,   4, 139, 118,  12,  38, 137,  28
1041 DATA 139, 118,  10,  38, 137,  12, 139, 118
1042 DATA   8,  38, 137,  20, 139, 118,   6,  38
1043 DATA 140,  28,  31, 202,  14,   0
1044 REM ----------------------------------------
1045 REM ****************************************
```

Here's how it works:

The first line gets two consecutive bytes from memory and assigns them to an integer variable. The next line (110) is a trick. The two bytes are used to store the address of a string. If this address is greater than 32767, the program returns an overflow error; using the *val* function this way enables us to store a number between 0 and 65535.

Next we *gosub 1012* to read the machine language program into the string variable Interrupt$.

Then we go to 300—a short subroutine that prints out the values of the registers and flags. You may find this useful for debugging; if not, omit the *gosub 300* in line 190 and delete lines 300 through 370.

Next we set up the Path$ variable. For this example and a complete directory, we chose *.* for our path. You can change this to *.bas or Aardvark.* or whatever you want.

Next you assign an attribute value. *Attr* = *−1* means match everything—all bits on. Other attributes you can specify are listed in the DOS 2.0 manual, pages C-4 and C-5. If you wanted, for example, to get the hidden files, you would assign Attr the value 02.

Then we go to the subroutine at line 400 to get the first matching directory entry. Line 460 sets up a buffer variable, a forty-three-byte data block in which to store the directory entry. Line 470 appends a 0 to the path variable, because DOS recognizes ends of names when it sees a 0. Line 480 puts spaces into the name field of the directory (to keep from getting garbage if a filename is smaller than the previous one), and lines 490 and 500 set pointers to the first bytes of Buffer$ and Path$.

Next we set up the registers. AX gets the function number &H1A00 (actually AH gets the function number 1A and AL gets 00) to call the *set DTA* function. This tells DOS where to put the directory entry. DX gets the buffer pointer, DS is set to 0 to indicate that the segment will be set to the *def seg* segment, and the variable Intnum% is assigned the number of the interrupt we want to call—in this case 21.

Next (and almost last) we go to the subroutine beginning at line 1007. We recompute the address just before the call in case Basic has moved our strings. *Finally* we call the GIC!

Then we return to line 520, set up the AX register with function 4E00, find the first matching file, put the path address in DX, add the attribute in CX, and call the GIC again.

We then decode the hex values in the buffer into the time, date, and so on; print these values; and, while there are additional directory entries, continue to get them, decode them, and print the results. See the DOS manual, page C-5, for a description of how the time and date bits are mapped.

Lines 560 through 650 get subsequent directory entries. They work much like lines 400 through 530. One important thing to note is line 610. This line recomputes the starting address of the buffer. Again, you can't assume Basic won't change this location; and, just in case Basic does, you also need to call function 1AH to set the DTA. You don't have to reset any other parameters; you can assume that the ones you set when you first called these functions are still valid.

This program, when run on a directory with six entries, produces a listing that looks like this:

```
AX=0000 BX=0000 CX=0000 DX=0000 DS=0000 FL=0000
AX=0000 BX=0000 CX=FFFF DX=B60C DS=09C6 FL=0046

BASIC.COM       3 / 8 / 1983     12 : 0 : 0            16256 bytes
DIR.BAS         7 / 5 / 1984     12 : 33 : 34          4462 bytes
NEWSCRL.BAS     6 / 11 / 1984     14 : 7 : 54          1878 bytes
DISKSPAC.BAS    1 / 1 / 1980     0 : 8 : 32            1920 bytes
INT.ASM         6 / 21 / 1984     14 : 58 : 10         2304 bytes
GIC             6 / 21 / 1984     15 : 44 : 24         11274 bytes
```

You can change the parameters of this program and do many other useful things. Examples include changing the mode of a directory entry, getting the volume label, getting the file creation date, scrolling, and checking a disk for the amount of free space.

In the March 1984 "Q&A" we wrote a program called *Chmoc* to mark a file in a directory as hidden. You can use the GIC to do this much more easily. Here's how:

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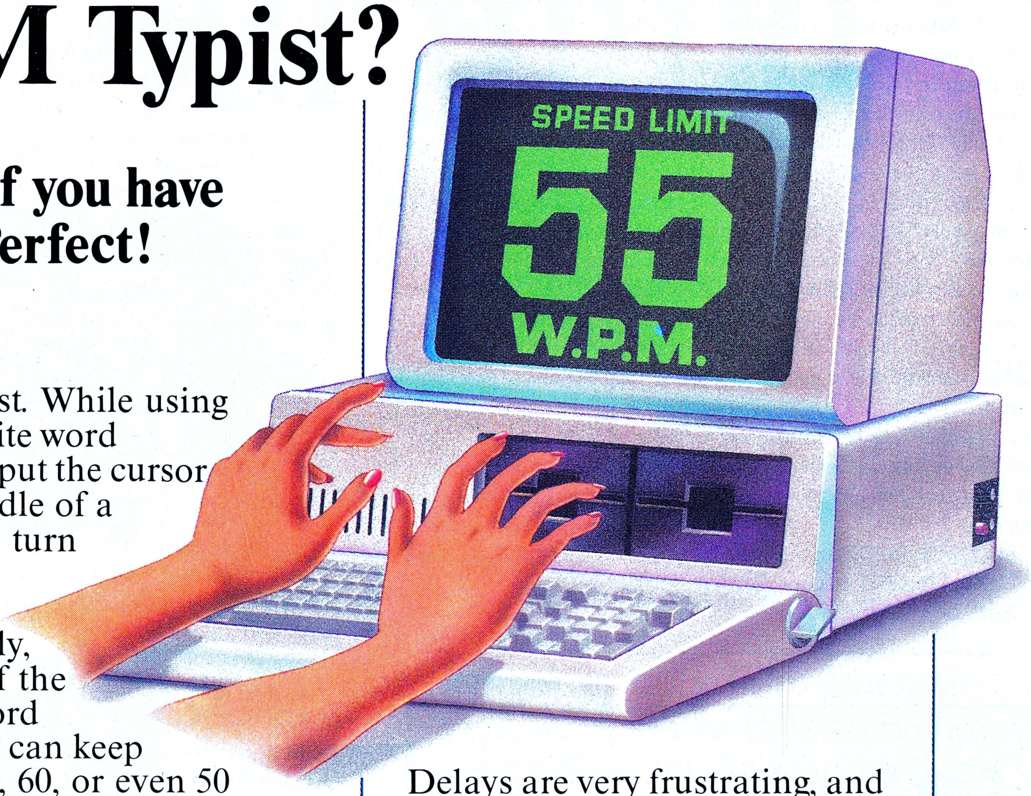

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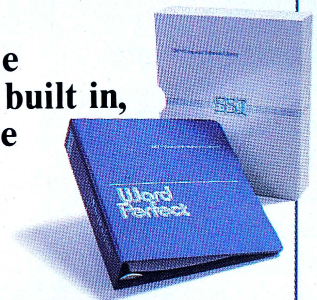

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1. Change Path% in line 190 to the filename you want to mark as hidden.
2. Change Attr in line 190 to 02, indicating a hidden file.
3. Change the value for AX% in line 520 to &H4301, the Chmod function.
4. Remove line 210 so the function will be called just once.
5. Run the program.

Now do a *dir* or *files* command; the file you marked as hidden should not appear. To get it back in the directory, just run the program again with Attr set to 1. This time your selected file will reappear in your directory.

Returning the volume label is even simpler. Use the original GIC program, the one that prints an entire directory, and simply change the Attr value to 08. Rather than printing an entire directory, the program will do a selective search and print only the volume label. There's a catch to this, though. Because of a bug in DOS 2.0 and 2.1, the program will return the volume label only if the label is not the first entry in the directory; in other words, this will work only on system disks (disks that have been formatted with the */s* option).

To get the creation date of a file, again run the original GIC program with Attr set to −1 and Path$ equal to the name of the file whose date you want to retrieve, but decode and print only the portion of the date you need.

In an earlier "Q&A" column we wrote a program to scroll text on the screen—one of our first attempts at DOS calls from Basic. The GIC makes this problem almost trivial. Here's how to use it to scroll the screen:

1. Start with the original Dir program.
2. Delete lines 100 through 900.
3. Add the following lines:

```
100 GOSUB 1014:   'read data
200 INTNUM% = &H10 'scroll uses interrupt 10
300 'Set up registers/parameters from info in
     bios listing in tech reference manual, page A-44
400 FOR I = 1 TO 16
500       AX% = &H601 : BX% = &H0 : CX% = &H303:
          DX% = &H1030 : DS% = 0
600  GOSUB 1007  'call the GIC
700 NEXT
800 END
```

4. Run the program!

Another way you might use the GIC is to check for free disk space. This is even easier than using it to scroll. Here's what to do:

1. Start with the original program.
2. Delete lines 100 through 900.
3. Add the following:

```
100 INTNUM% = &H21
200 GOSUB 1014
300 DL% = 0 'This says check the default drive;
               otherwise, 1 = A, 2 = B, etc.
400 AX% = &H3600 'DOS function 36 returns free
                   diskspace
500 GOSUB 1007 'Call the GIC
600 DISKSPACE = AX% * BX% * CX% 'Compute the number of
                                  bytes
700 PRINT DISKSPACE
800 END
```

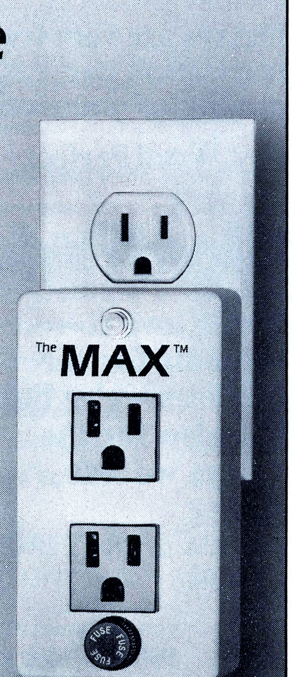
4. Run this program and compare its result to that produced by the DOS *chkdsk* command. If you have a match, you've done it right.

After you've used the GIC awhile, your DOS 2.0 manual will open directly to Appendix D, and some of you may actually turn Basic into a systems language.

Many thanks to Kirk Brennan and Jerald Steiner for sending the questions that prompted this program. Also special thanks to Jim Tomlin for conceiving the GIC idea and writing the code.

Now, for those of you from Missouri, here's the assembly code that produced the GIC. ▲

```
; The Great Little Interrupt Caller
;
; Allows for use of interrupts 10H-17H, 21H, 25H, and 26H from
; within a BASIC program.
;
OURSEG  SEGMENT
        ASSUME  CS:OURSEG,DS:OURSEG,ES:OURSEG,SS:OURSEG
;
; Here are the offsets from BP of the parameters passed by the
; BASIC CALL statement:
;   CALL INTERRUPT! (INTNUM%,AX%,BX%,CX%,DX%,DS%,FLAGS%)
;
       _INT=16d         ; address of INTNUM%
        _AX=14d         ;               AX%
        _BX=12d         ;               BX%
        _CX=10d         ;               CX%
        _DX=8d          ;               DX%
        _DS=6d          ;               DS%
        _FL=4d          ;               FLAGS%
;
; The macro SET is used to copy the value of a BASIC variable into
; the corresponding 8086 CPU register:
;
SET     MACRO   REGISTER
        MOV     SI,_&REGISTER [BP]
        MOV     REGISTER,ES:[SI]
        ENDM
;
; Macro SET0 is like SET except it will only do the copy if the
```



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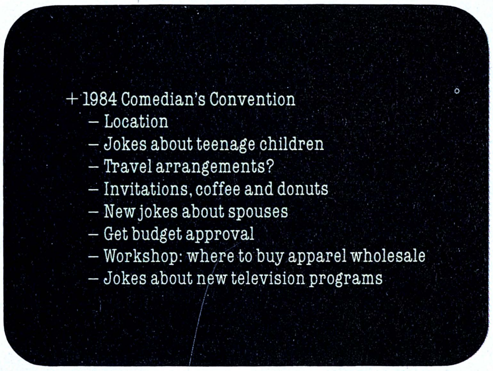

```
+ 1984 Comedian's Convention
   – Location
   – Jokes about teenage children
   – Travel arrangements?
   – Invitations, coffee and donuts
   – New jokes about spouses
   – Get budget approval
   – Workshop: where to buy apparel wholesale
   – Jokes about new television programs
```

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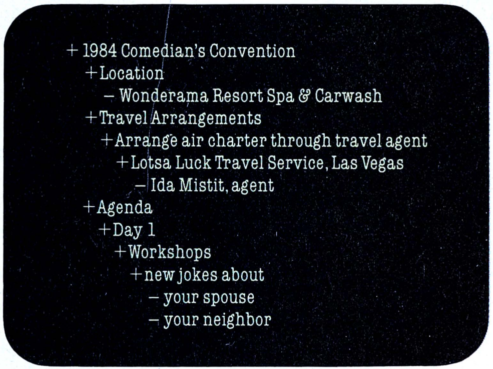

```
+ 1984 Comedian's Convention
   + Location
      – Wonderama Resort Spa & Carwash
   + Travel Arrangements
      + Arrange air charter through travel agent
         + Lotsa Luck Travel Service, Las Vegas
            – Ida Mistit, agent
   + Agenda
      + Day 1
         + Workshops
            + new jokes about
               – your spouse
               – your neighbor
```

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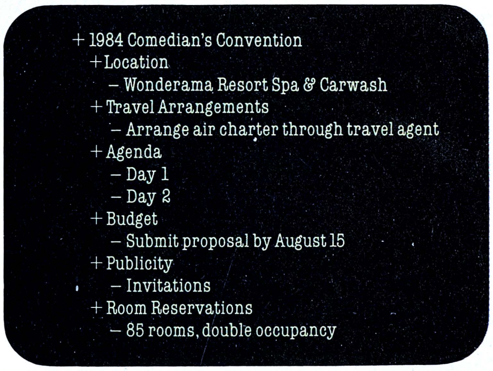

```
+ 1984 Comedian's Convention
   + Location
      – Wonderama Resort Spa & Carwash
   + Travel Arrangements
      – Arrange air charter through travel agent
   + Agenda
      – Day 1
      – Day 2
   + Budget
      – Submit proposal by August 15
   + Publicity
      – Invitations
   + Room Reservations
      – 85 rooms, double occupancy
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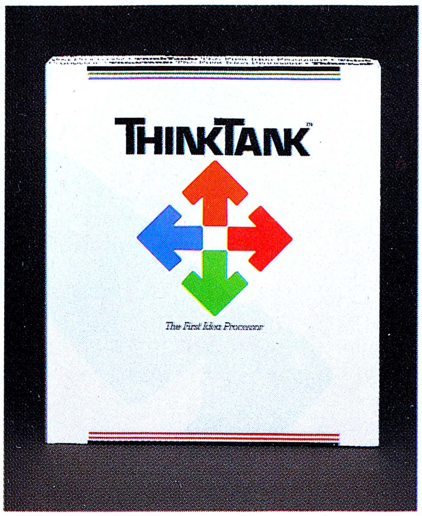

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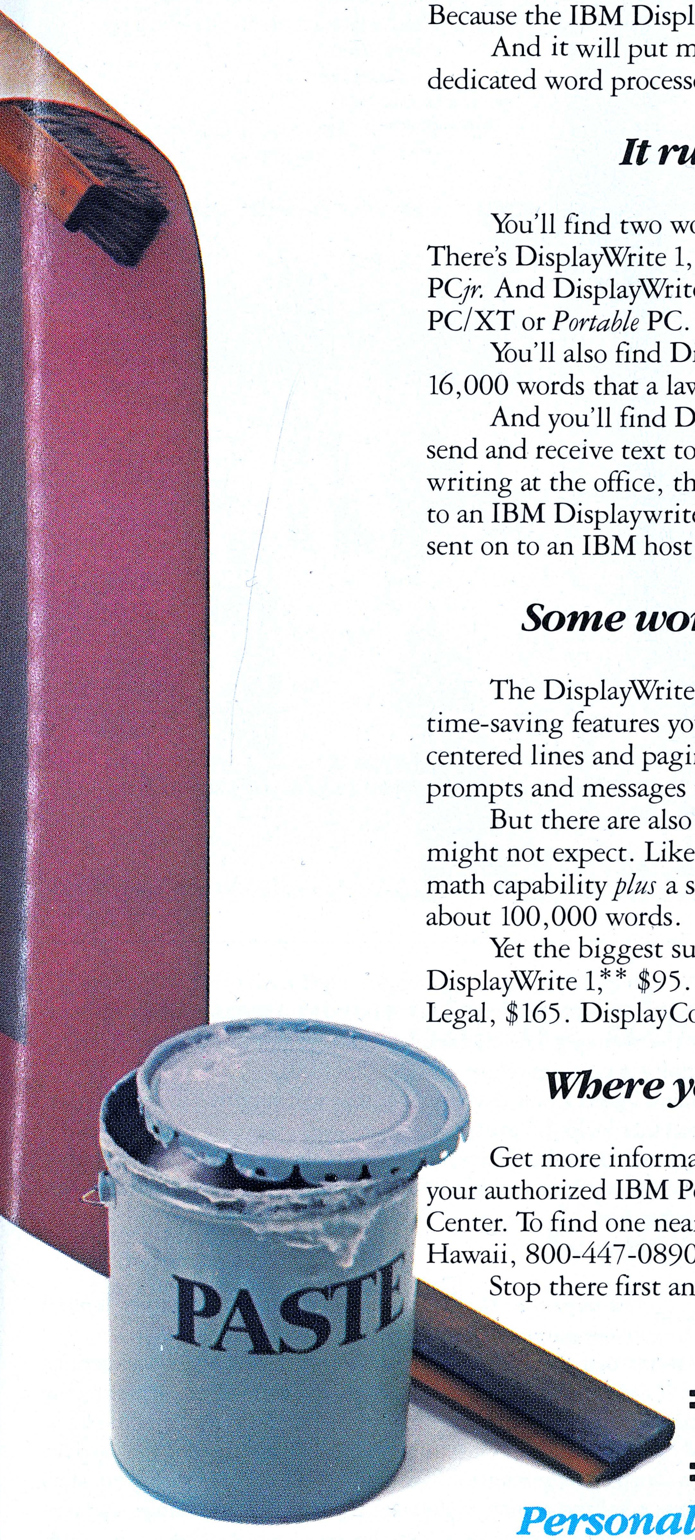

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```
; BASIC variable is NOT zero.
;
SET0    MACRO   REG
        LOCAL   SKIP
        MOV     SI,_&REG [BP]
        CMP     WORD PTR ES:[SI],0
        JZ      SKIP
        MOV     REG,ES:[SI]
   SKIP:
        ENDM
;
; GET copies from the CPU register back to the corresponding
; BASIC variable.
;
GET     MACRO   REG
        MOV     SI,_&REG [BP]
        MOV     ES:[SI],REG
        ENDM
;
; GETFL copies the CPU flags register into BASIC variable FLAGS%.
;
GETFL   MACRO
        LAHF
        MOV     AL,0
        XCHG    AH,AL
        MOV     SI,_FL [BP]
        MOV     ES:[SI],AX
        ENDM
;
; Macro INT? checks the value of INTNUM% and if it matches, executes
; that particular interrupt call.
;
INT?    MACRO   N
        LOCAL   SKIP
        CMP     SI,N
        JNZ     SKIP
        INT     N
        JMP     SHORT EXIT
SKIP:
        ENDM
;
; Here's the entry point BASIC will use:
;
BASINT  PROC FAR
        NOP
        MOV     BP,SP               ; Get pointer to base of parameter block.
        PUSH    DS                  ; CALL statement wants this preserved.
        SET     AX                  ; Copy BASIC
        SET     BX                  ;   variables
        SET     CX                  ;      into
        SET     DX                  ;         CPU
        SET0    DS                  ;            registers.

        MOV     SI,_INT[BP]         ; Get value of INTNUM% into SI.
        MOV     SI,ES:[SI]
        INT?    10H                 ; Dispatch
        INT?    11H                 ;
        INT?    12H                 ;
        INT?    13H                 ;      to
        INT?    14H                 ;
        INT?    15H                 ;
        INT?    16H                 ;            requested
        INT?    17H                 ;
        INT?    21H                 ;
        INT?    25H                 ;                  interrupt.
        INT?    26H                 ;
EXIT:
        GET     AX                  ; Copy
        GETFL                       ;   CPU
        GET     BX                  ;      registers
        GET     CX                  ;         back
        GET     DX                  ;           into BASIC
        GET     DS                  ;               variables.

        POP     DS                  ; Restore DS.
        RET     14D                 ; Return to BASIC and clean up stack.
BASINT  ENDP

OURSEG  ENDS
END
```

Q: Help! My PC and printer don't like each other. When the PC commands, "Print a line, then do a carriage return and line feed," the printer, a TRS-80 Daisywheel II, responds by printing a line, then doing a carriage return and *two* linefeeds.

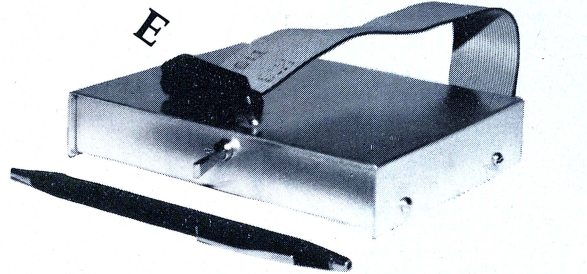
I think I need a new device driver that will suppress the extraneous linefeed that DOS 2.0 produces.

I contacted Radio Shack and they were no help. They couldn't imagine why anyone would want to connect one of their printers to an IBM computer.

K.R. Hammond

A The person at Radio Shack apparently has a rather limited imagination.

It seems that the computer is sending two characters—a carriage return character and a linefeed character. The printer is interpreting the carriage return as a carriage return/linefeed and then getting the additional linefeed. The default setting on the Daisywheel II is the carriage return/linefeed combination—control code OD. Before you start printing, send the printer control codes 1B,15. This enables carriage return only, not the carriage return/linefeed combination. ▲



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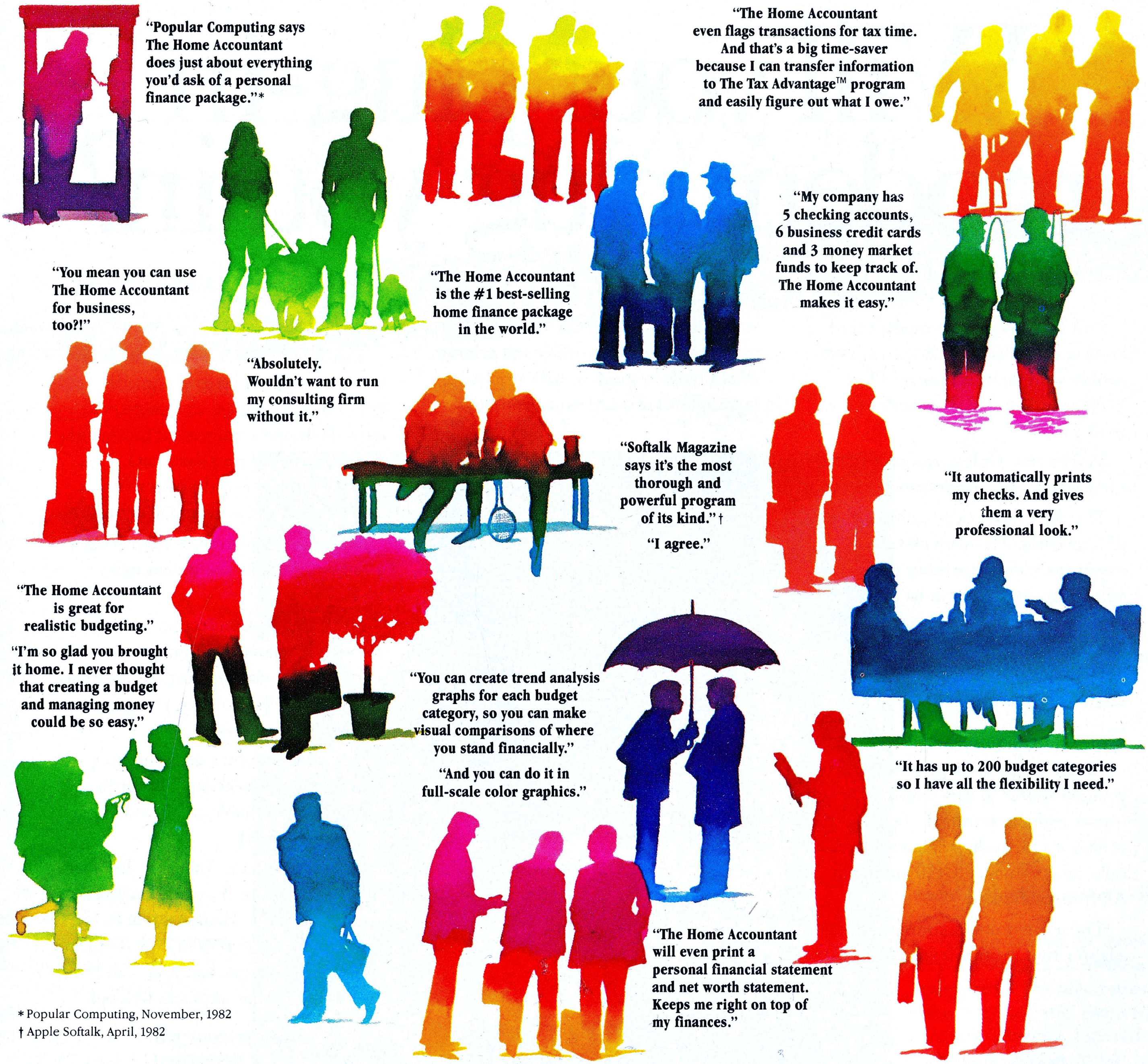

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* Popular Computing, November, 1982
† Apple Softalk, April, 1982

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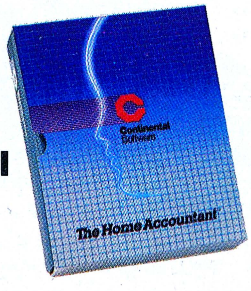

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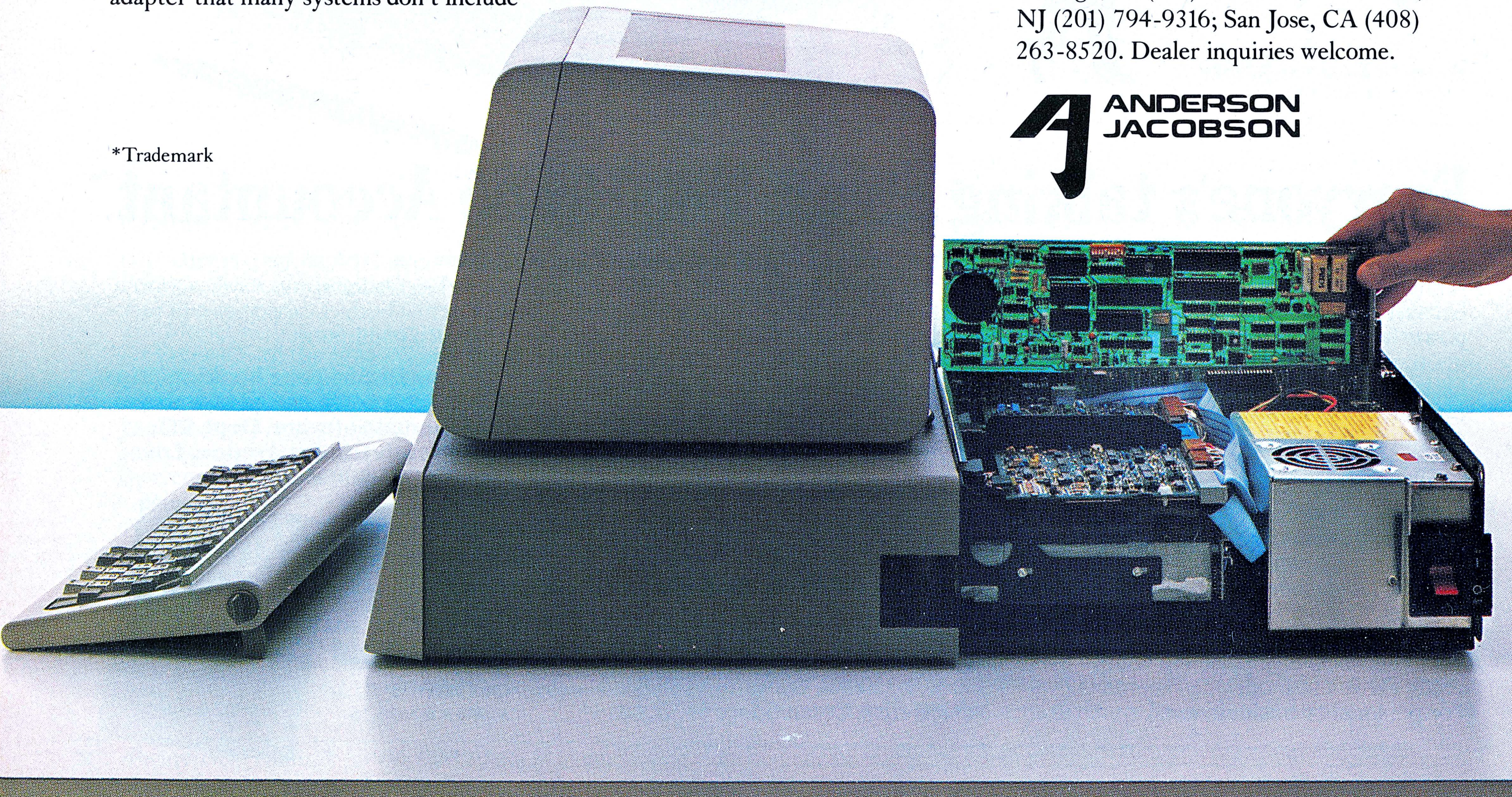

Esther Dyson

Portrait of an Industry Watcher

By Nancy Andrews

No pictures. No ads. Seventeen pages of straight single-spaced copy. Boy, does this look dull.

Then you begin to read, and in spite of how it looks, you can't put it down.

It's *RELease 1.0,* written entirely by Esther Dyson, who at thirty-two has become one of the sharpest and most influential observers of the microcomputer world. Dyson does what most of us wish we had time to do: She interviews company execs, attends industry gatherings, talks to customers, and tries out new, sometimes unannounced, products. She gathers this information, digests and synthesizes it, and then offers her perspective, which, besides being intelligent, is also lively, candid, and fun to read.

Dyson's almost 2,000 subscribers pay $395 a year for fifteen issues of *RELease 1.0.* These subscribers are not typical end users; rather they're the industry people she writes about—CEOs, marketing execs, technical people, people who set strategy.

"There's a tremendous correlation," says Dyson, "between whom I write about and my subscribers." She claims that a portion of her subscribers are Wall Street investment people, but not as many as earlier, when the newsletter was owned and written by Ben Rosen. "Ben was more stock market-oriented."

Dyson prefers an industry rather than a financial perspective. She tells a story about a call she received from a *Barron's* reporter, who said, "I'd like to talk to you about the recent move in technology stocks this week." And she said, "Okay." Then there was this silence. Finally, Dyson said, "I'm a little embarrassed, but do you mean a move up or a move down?" And he said, "Forget it. I'll try someone else."

Dyson describes herself as "the lens through which the industry can see itself. I like talking to smart people and figuring out what's going on, understanding the dynamics. I like to make connections, to understand how things work. If you look at a house, you see a house. Then if you take away the wood on the inside, you see lots of beams, and you're getting closer. But what I like to do is see how it fits together and where the stresses are—where, if you took just one beam away, the whole thing would collapse.

"I like to see new companies being made and the strategies. . . ."

So Dyson does just that, traveling mostly from New York to her second base, Hyatt Rickey's in Silicon Valley. There she talks to industry execs and ferrets out the information she needs. Some days her schedule sounds like a page out of *Who's Who in Computerdom*.

The evening before her interview with *Softalk*, for example, Dyson arrived in town to attend a party for Floyd Kvamme, the former executive vice president of worldwide sales and marketing for Apple Computer who was about to join the private venture capital firm of Kleiner, Perkins, Caufield, and Byers. The following day it was breakfast with Maria Ligeti, formerly of Seeq, now with her own venture; then this interview; then lunch spent on the phone working out details for the issue of her newsletter that was scheduled to go to the printer the next day; then on to Hewlett-Packard to see that company's new machine (the HP110); from there to Apple to meet with Bill Campbell; and, finally, to dinner with the Ashton-Tate *Framework* group.

> "I don't really care if the new machine is 128K or 256K; I care whether it's going to be successful. . .

Dyson contrasts the accessibility of microcomputer industry people with the more formal, less approachable, style of people in other industries. "When I worked for *Forbes*," she recalls, "there were a lot of business types you could never see without the company PR rep there. In this industry, of course, it's different. And I can be friends with the people as well as have interviews."

Back in New York, where she writes and produces her newsletter, Dyson relies on a staff of three. They are twenty-one-year-old Rona Levine, publisher of EDventure Holdings (the company that produces *RELease 1.0*), and two clerical workers. Additional support comes from a PC, a Compaq Plus, three Apple IIIs, and a NEC Spinwriter, with occasional graphics contributed by Lisa or Mac.

Dyson's critics say the newsletter has changed since she took over for Ben Rosen in June 1983. Indeed it has. When the newsletter was owned and written by Rosen, a portion was devoted to the semiconductor industry. Under Dyson's editorship, the semiconductor coverage has been dropped; *RELease 1.0* is now exclusively a personal computer industry letter. Dyson admits that circulation has fallen off a bit since the change, but this doesn't trouble her. She says, "If someone wants a dog and you're selling a cat, you don't want to sell to them."

Some say Dyson is not a prognosticator as Rosen was. They describe her as a reporter. She says, "I don't really care if the new machine is 128K or 256K; I care whether it's going to be successful, and there's nobody in the world that knows that. Just God."

Those who value Dyson's work say her strengths are her abilities to cull information into a cogent, one-stop summary and to uncover out-of-the-way developments.

As Dyson sees it, she's in the explaining business rather than the forecasting business; if you explain well, she says, you can give some indication as to trends. She "doesn't do numbers"—maintaining that numbers are only interesting when the curves change and that you foresee such changes not by watching the curves themselves but by noticing when and how people begin to think differently.

In addition to publishing the newsletter, EDventure sponsors an annual forum for subscribers—a three-day $995 event. Dyson says that one appeal of this forum is that the audience is as interesting as the speakers.

"You can't afford not to be there," declares a software marketing manager. "You don't go to listen. If you're an industry executive, what can a panel of your peers tell you that you don't already know?"

EDventure, formerly Rosen Research, was founded by Ben Rosen, who is now a partner in the venture capital firm Sevin Rosen Management. Rosen, a well-known electronics analyst, wrote the Rosen Electronics Letter for ten years; that newsletter was the forerunner of *RELease 1.0*.

Dyson met Rosen, whom she describes as "the one who introduced Wall Street to the personal computer industry," when she was planning a trip to Japan as a *Forbes* reporter. Several years later, after she'd attended some of his forums and gotten to know him during her time on Wall Street, Rosen asked Dyson to join Rosen Research. She wasn't ready.

A year later she was ready and called Rosen. In August 1983 she joined the company and began to write the pc half of *RELease 1.0*. At that time Rosen, an investor in Compaq and Lotus, needed someone to do the personal computer coverage for the newsletter so that he wouldn't be accused of bias.

"It soon became apparent," Dyson says, "that whether or not he was honest and brave and forthright and unbiased, he didn't look that way. So I took over the writing entirely in November, we announced in January that I would buy it, and then we finally got the lawyers together and closed the transaction in June."

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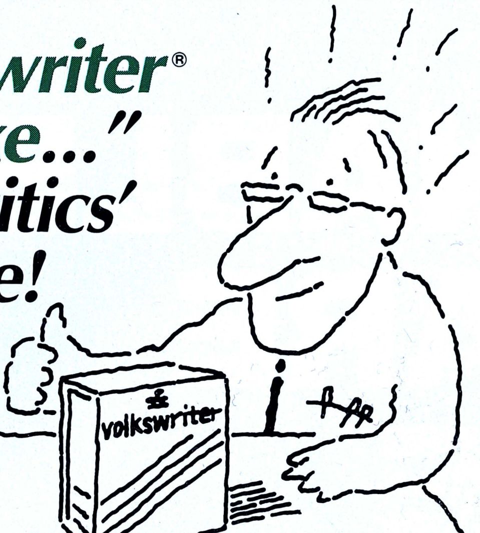

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Charles Spezzano, Whole Earth Software Review, January 15, 1984

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Washington DC Capital PC User's Group Vol. 3, #4

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John Lombardi, Reviewer, InfoWorld, April 16, 1984

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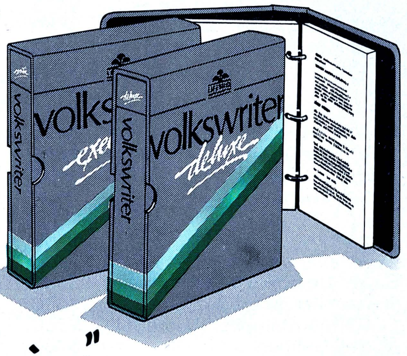

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Dyson says her trade has always been writing and that what drives her more than anything else is intellectual curiosity. At age eight she started the *Dyson Gazette* to report such eight-year-old industry news as Dorothy lost a tooth and Emily got a hamster.

She admits to only twelve years of formal education, even though she graduated from Harvard in 1972 with a degree in economics.

"What I really did at Harvard," Dyson says, "is work on the *Crimson* and see movies." She says she got her business education at *Forbes*, where she spent three years doing "case studies." "In business school when you do case studies, you read books; at *Forbes*, you go and interview the principals. *That's* always been my style—go out and talk to people."

From *Forbes*, she went to New Court Securities (now Rothschild, Inc.) to be a securities analyst specializing in small computers and software, and from there she went to Oppenheimer & Co., an investment banking and brokerage house. At Oppenheimer she created her own job, again researching small computers, as well as services and software. She did this for two and a half years until she realized she didn't want to spend time talking to people in banks when she could be talking to people in the computer industry. That's when she called Rosen.

Dyson bought Rosen Research last June, and in March the company gave Ben Rosen back his name and changed its own to EDventure Holdings, Incorporated. The press release they sent out began, "Rosen Research runs out of stationery, changes name."

Dyson has no ambitions to grow the newsletter's staff. She says she wants to continue to do it herself, and the last thing she wants to be is an editor. "My title is editor-in-chief, but only because it sounds better than writer." One of her strengths is her approachability. She returns phone calls.

> "Framework" is certainly on the power user end of the market, but it seems a little more accessible to the naive user...

Gracious and a bit self-effacing about her influence, Dyson claims she is where she is because of "the mantel that Ben generously handed over. Once you get to where I just by luck started, life gets a lot easier. You can talk to people, and they return your calls."

Dyson is often asked if her position in the industry is a big responsibility and if she takes it seriously. She replies, "Nowadays, I don't take myself very seriously, but you have to take the newsletter seriously. I don't care a whole lot if I'm wrong or right, but a lot of people do, so I'd better make sure that I am right—because other people pay attention."

Now and then, *RELease 1.0* has sections titled "RELease 0.5 HALF-BAKED NEWS" and "RELease 1.5: AFTERTHOUGHTS" to deal with changing events and information. The newsletter is like a first release of a software product; it's as up to date and complete as possible, but it's always subject to revision.

Dyson claims that being a woman in the male-dominated high-tech industry has been a plus for her. She's not competing with the entrepreneurs and so is not a threat. And, in fact, being a woman gives her added useful visibility.

She also says she's completely happy. "There is nothing I do that I don't want to do, and I don't know anyone else who can say that. Ronald Reagan has to do a lot of things he doesn't enjoy; I only have to write about what I think is interesting. And I operate on the somewhat arrogant assumption that what's of interest to me is of interest to the readers. That's why they subscribe." ▲

RELease 1.0: A Sampler

If Esther Dyson is a lens for the industry, *RELease 1.0* is a lens for Esther Dyson. *RELease 1.0* reflects her style, personality, and intelligence. Here are some excerpts:

On copy protection:
The most valuable move toward software protection taken recently has been Lotus's suit against Rixon. . . .It's foolish to think that we've got to make everyone scared of being caught; all we need to do is make them scared of being thought tacky rather than smart. That alone would drop the incidence of copying by half, we'd guess. *3/8/84*

On software bundling:
Gather any five software vendors in a room and they'll all agree that bundling will destroy pricing in the software business. Take any of them out onto the porch to offer him a deal and he'll ask only, "How much?" *6/1/83*

On user interfaces:
This year's equivalent of the bow tie for women M.B.A.s is the mouse . . . .Human interface doesn't divide up into easy categories and theories. Some advances are fundamental, like undo buttons. . .and others are mundane, silly little things like "Do you really mean to do this with all your heart?" warnings. . . .Some people like a computer that calls them by name; others find it as offensive as the salesman who insists on the same familiarity. *12/32/83*

On windows:
Overall, the real problem with most windows and tiles these days is that the screens they appear on simply aren't large enough or high-resolution enough for more than one or two reasonable-size windows. Xerox's Star is a notable exception. *12/32/83*

On "user-friendly":
Perhaps the first rule of interfaces is "Like mother's cooking, what you're used to works best." Committed *WordStar* users can operate with control characters in their sleep. Practiced Lisa users don't think about clicking twice; they just do it. Mouse handlers sneer at cursor keys; experienced typists can zip around a keyboard with incredible speed using home, shift, cursor, control, and other keys in combination. Lotus users type in succession the first letters of the commands they want, rather than laboriously moving the cursor across successive rows of commands. The question is not just, "What is easiest to use?" but also, "What is easiest to get used to?" *12/32/83*

On good software:
On a scale of 1 to 10, what makes a good software product? An 8 from a good family, of course. Much of what we saw at Comdex [Spring '83] — notably *PFS:Write* and *Friday!*—was interesting as much for how well it will sell as for its inherent qualities. There's a lot of reasonably good product that doesn't stand a chance against equally good product with a strong company and an installed base to link into. *5/4/83*

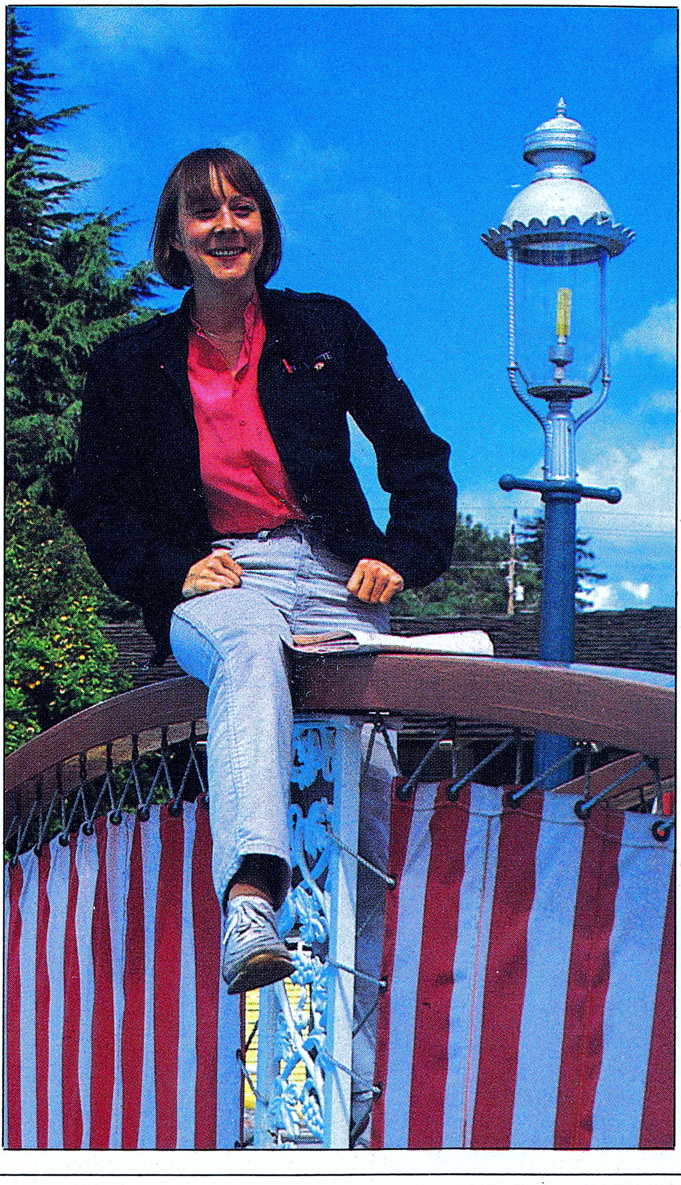
On *Framework*:
Like Lotus, like *Symphony*, like *dBase II*, it's targeted mostly at the power user. However, *Framework* is for the word nut, not the number nut. We asked Lotus whether the market for spreadsheets wasn't close to getting saturated, and the best response we could get was that people use spreadsheets for all kinds of things: little data files, calculations, etc. Maybe so, but that's been true only in the absence of a product like *Framework*, which includes spreadsheet capabilities but doesn't center on them. That's an advantage if you're just a thinker trying to create a document with perhaps a table or two embedded in it.

There's also another way to slice the market: power users vs. Apple's "the rest of us." *Framework* is certainly on the power-user end of the market, but it seems a little more accessible to the naive user (unlike *dBase II*) because of its word processing orientation. *Framework*'s Fred programming language has 140 commands, compared with about 240 in *1-2-3* and almost 500 in *Symphony* or the *dBase* language. Hardware requirements (256K) also let *Framework* access a larger market than *Symphony* (320K) or (especially) *Ovation* or *DayFlo*, which both require hard disks. That, of course, may present a problem as well as an opportunity for Ashton-Tate: The company is highly regarded for its support of third parties; it may be less adept at supporting end users. *4/17/84*

On Compaq:
Compaq's appeal has always been more than just portability or even price. The company has done an impressive job in its first year, lining up a solid array of some one thousand dealers, most of whom also carry the IBM line, and beating IBM to the punch with both a luggable (Compaq's first product) and a hard disk pc, announced last fall and shipping in volume now. . . . Indeed, recognition is great; the product is great; the only problem has been the unwillingness of people to buy from a start-up in these days of shakeouts and fold-ups. Compaq is attempting to cure that with a new flight of ads stressing the company's stability rather than the product's features. Much like Amdahl, whose salesmen's white shirts are always even brighter than IBM's and whose offices are an oasis of ties and jackets in the Silicon Valley sartorial desert, Compaq is trying to "outserious" IBM. *2/22/84*

On IBM:
Thus the answer to whether IBM will be open or closed is yes. IBM has long had a number of conflicting strategies and incompatible product lines. . . . It's a perpetual war between standards and innovation.

IBM continually brings out new products, and lets the market decide which it likes. . . .This trial-and-error approach lets IBM behave more flexibly than might be the case in a company whose balance sheet (and soul) depended on the success of a single product or line. IBM has no illusions (except from time to time, as with the PC*jr* that everything it brings out will automatically sell. It knows it is one of the few companies that can afford to learn through experimentation. *4/17/84* ▲



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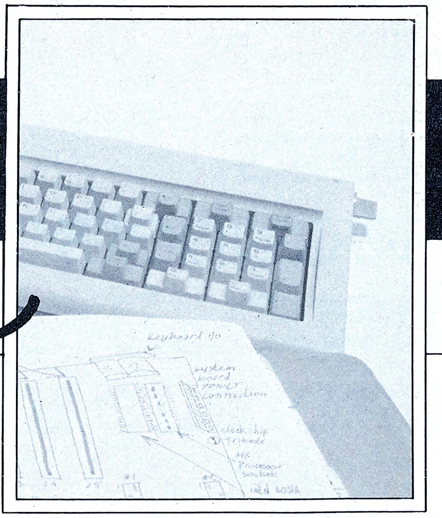

SYSTEM Notebook

by Alan Boyd

Command Line Editing in DOS

This month we'll focus on one of the most readily available and little-used features of DOS—its command line editing capability.

DOS actually offers two levels of editing capability. The first is a simple command line editor that uses the ten function keys; the second is Edlin, a line-oriented mini-editor stored in a DOS file and callable as a DOS command.

First-level editing is available any time you're at the DOS command line interpreter. Simply stated, DOS stores in a buffer the last line you have entered. Whatever is in this buffer is available for you to edit or re-enter. To see this buffer in action, enter a command on the command line, such as

```
A>DIR B:*.COM
```

When DOS has finished carrying out this command, press the F3 key and DOS will display the command again; but it won't execute the command until you press the enter key.

This is an example of the use of the special function keys as editing keys. The F3 key tells DOS to display the buffer's contents.

The best way to think of this buffer is as a template; this template holds the contents of the last line you entered into the command line interpreter and can be operated on by means of the function keys. Let's take a look at the operation of these keys and see how they may be used to speed up the entry and editing of DOS commands.

F1. When you press the F1 key, DOS displays the next character from the template. This key is particularly useful when you have made a typing mistake in entering a DOS command; by pressing the F1 key repeatedly you can re-enter your most recent command a character at a time and stop at the point where you made the typo. You can then enter the correct letter and proceed to the end of the command. For example, enter the following:

```
A>DIE B:*.COM
```

to which DOS will reply with an error message, since the command *die* doesn't exist as an internal command and there probably isn't a file named Die.com, Die.exe, or Die.bat on your disk. Of course you really meant to enter the *dir* command but pressed *E* instead of *R*.

To correct this situation, you should first realize that DOS has stored the string *DIE B: *.COM* in its editing template. There are eleven characters in the string (including the blank space between the DIE and the B:*.COM), ten of which are correct; the function-key editing facilities make it possible for you to re-enter the command without having to re-enter the ten characters you got right the first time. All you have to do is press the F1 key repeatedly to enter each letter up to the typo; then type an *R*, then hit the F1 key until you reach the end of the line. At this point, the correct command should be displayed on the command line. Now you can press enter, and DOS will execute the *dir* command.

Although this may at first seem like a lot of work to accomplish so little, keep in mind that once you have mastered the DOS editing keys, you'll take them for granted and won't think twice about using them. Familiarity with their use will allow you to recover from a typing error much more quickly than you otherwise would, particularly if the command in which you've made the typo is a long one.

F2. The F2 key tells DOS to copy all the characters, up to a specified character, from the editing template to the command line. For example, to use this editing key on our

```
A>DIE B:*.COM
```

command, simply press the F2 key followed by the *E* key. DOS will then repeat all the characters from the editing template up to but not including the *E*. You can then press the *R* key and, as before, press F1 eight more times until the contents of the template have been repeated on the command line.

F2 is particularly useful for fixing long commands in which you've made a single typo. It's even more useful in conjunction with F3, as we are about to see.

F3. As you probably know, pressing F3 is a convenient way to re-enter the last command you typed at the DOS command line. However, its real use goes considerably further. More generally, what it does is enter all the characters in the template from the current position to the end.

Of course, if you're at the DOS prompt, then your current position is at the beginning of the line, in which case when you press F3 the entire command will be re-entered. However, if you're part of the way into the template, as you would be if you were correcting a typo, then pressing the F3 key will copy all the characters remaining in the template and place them on the command line.

So, referring once more to our *DIE B: *.COM* example, we can see that after substituting *R* for *E*, we could use the F3 key to fill out the remainder of the command. In other words we could use F2 to enter the beginning of the command (the part we had already typed correctly), then make our fix, and hit F3 once to finish the job. The combination of the two editing keys reduces the number of keystrokes necessary to correct our typo from eleven to four—a considerable savings, particularly for us hunt-and-peck typists.

F4. F4 is the functional opposite of the F2 key. Whereas F2 copies all the characters (up to a specified character) from the template to the command line, F4 skips over everything up to a specified character. This key is particularly useful at those times when your fingers have, of their own accord, done the walking—all over the keyboard.

For example, if, in trying to enter a simple command, you happen to enter something like

```
A>DISKCOOOOOOOOOOOPY A: B:
```

(easy enough to do, given the PC keyboard's typematic functioning), you can correct your mistake quite easily by using a combination of the F2 and F4 keys.

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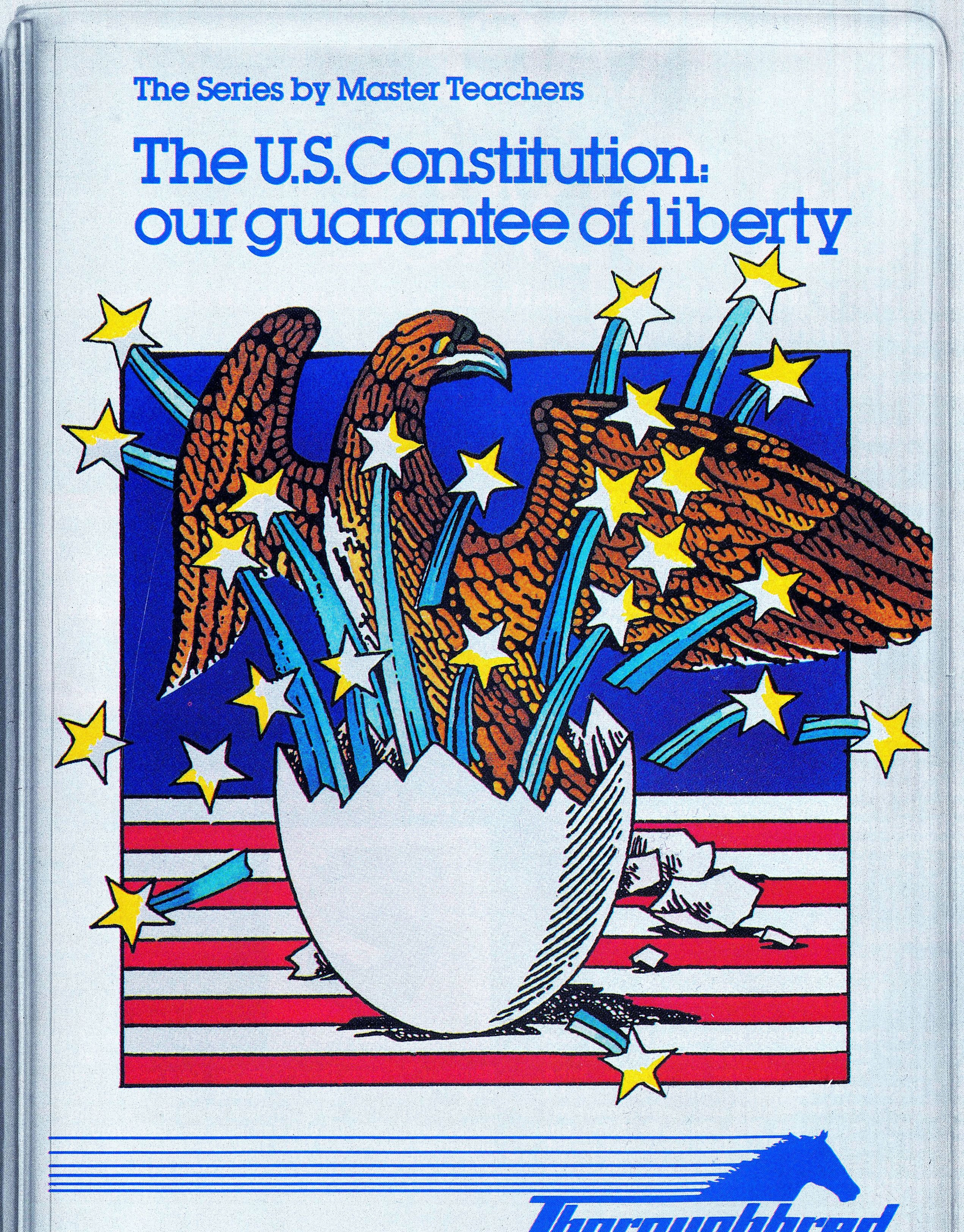

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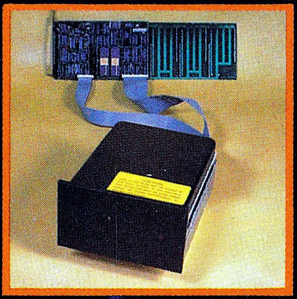

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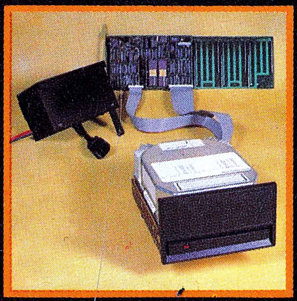

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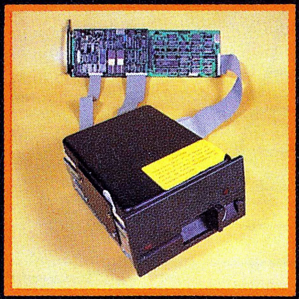

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the command line:

```
A>DISKC
```

Next enter the single *O* needed in your command line (or simply press F1, since the next letter in the template is the first *O* in the sequence). Now the command line will look like this:

```
A>DISKCO
```

At this point you can use the F4 key to skip over all the other *O*s in the template. Simply press F4 followed by the *P* key, since *P* is the next character you need in your command. This doesn't change the appearance of the command line (that is, you won't see a *P* appear on-screen). What happens is that the *position* in the command line template changes.

Imagine that there's a pointer always pointing to the current position in the template. Whenever you press the F1 key, DOS displays the character currently under the pointer and moves the pointer to the next position. (If you press some other key—such as, for example, an *R* to correct a mistaken *E*—this too moves the pointer forward one position.) The F4 key enables you to change the position of the pointer without displaying any characters. You simply type F4 followed by the next character you want the pointer to point to.

In our *DISKCOOOOOOOOOOOPY* example, when we pressed F4 followed by the letter *P*, we moved the pointer to the *P* that followed all those *O*s. Now we can simply type F3 to empty the rest of the template into the command line. Doing so will make the command line look like this:

```
A>DISKCOPY A: B:
```

which is indeed what we were trying to enter in the first place.

It may have occurred to you that you could probably retype *DISKCOPY A: B:* in less time than it would take to remember which function keys to press in which order. However, since every new version of DOS brings this operating system closer in style and spirit to Unix, it's reasonable to expect that command line editing will get more and more important as time goes on. Those of you who are used to creating new functions on the fly by redirecting the output of one command through one or more filters to another command know that one simple typing mistake can cause serious grief. Simple command line editors such as the one supplied in DOS can be momentary lifesavers.

F5. The F5 key is perhaps the strangest of the DOS command line editing keys. Even though its use is simple, the reasons for its use are complex. In essence, when you press the F5 key, DOS jettisons the existing contents of the template in favor of the current command line.

F5 is useful if, when editing the template of an older mistyped command, you create another typo and want to re-edit the command line without sending the current contents through DOS. Let's look at an example.

Suppose you enter the command

```
A>DISLCOOOOOOOOOOOOPY A: B:
```

by accident, but you don't see the mistyped *L* where a *K* should be. Suppose you have already gone through the exercise of reducing this to the somewhat more correct (but still wrong)

```
A>DISLCOPY A: B:
```

Finally you see the other typo: There are two ways to correct the situation.

One way—perhaps the simpler way—is to press the enter key and wait until DOS informs you that you've entered the command incorrectly again. This, of course, requires a disk access; DOS has to make sure there's no file named Dislcopy.com, Dislcopy.exe, or Dislcopy .bat on your default drive. This delay can last several seconds. In the process, the modified but still wrong command will be stored in the DOS editing template, so it will be easy to get it right on the third try.

The second way to deal with this problem is to use the F5 key. Pressing this key takes the characters displayed on the command line and places them in the editing template. Once at this point you can use the other editing facilities to correct your last mistake. Note that F5 doesn't send the erroneous command to the command line interpreter, so the disk access and consequent delay are avoided.

Escape. The escape key is another interesting key for use in command line editing. It's good for those situations where you've modified the command line template to such an extent that you no longer know where you are. One way to figure out where you are is to press F3 to display the rest of the command line template and then F5 to replace the old template with the new command line. There are problems with this approach, however; you may have edited the template beyond all recognition or perhaps skipped over too many characters and compounded what was previously a simple error into meaningless drivel. Perhaps the best thing to do under these circumstances is abort the current attempt at editing the command line template and go back to where you were before you attempted the edit. This is exactly what the escape key does for you.

When you press escape, the current entry on the command line is aborted while the contents of the editing template are left intact. This takes you back to where you were before and allows you to re-edit the template.

Insert. The last two keys that can be used with the command line editor are the insert and delete keys. Use these keys when you've entered too many characters on the command line or haven't entered enough. The insert key allows you to enter a character on the command line without changing the pointer's position within the template. This is extremely useful when, for instance, you've entered a long command with one character missing.

If, for example, you have entered the command on one line

```
A>COPY A:\USR\ALAN\MEMOS\TEST
    B:\USR\FRANK\MEMOS\TEST
```

and have inadvertently omitted the second *M* in the last *MEMOS*,

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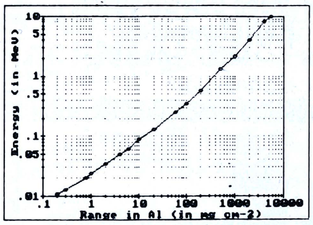

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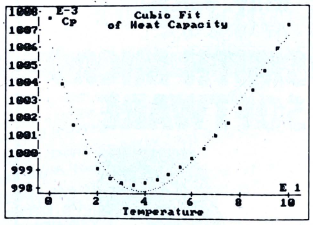

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making your command look like this:

```
A>COPY A:\USR\ALAN\MEMOS\TEST
    B:\USR\FRANK\MEOS\TEST
```

then you'll probably agree (particularly now that you know more about command line editing) that re-entering the entire command would be tedious.

It's easy to correct a mistake of this kind using the command line editor. All you have to do is press F2 followed by the K key—since the K in *FRANK* is the first unique character before the missing *M*. DOS will copy the command line template up to the *N* in *FRANK*, making the command line look like

```
A>COPY A:\USR\ALAN\MEMOS\TEST
    B:\USR\FRAN
```

Then you can press the F1 key four times to advance up to the *O* so that the command line will look like

```
A>COPY A:\USR\ALAN\MEMOS\TEST
    B:\USR\FRANK\ME
```

At this point, the pointer in the template is pointing to the next character, the *O*. What you want to do now is enter another character on the command line without changing the position of the pointer. The insert key lets you do so. Just press insert followed by *M* and your command line will look like

```
A>COPY A:\USR\ALAN\MEMOS\TEST
    B:\USR\FRANK\MEM
```

And, finally, press F3 to copy the rest of the template onto the command line. This produces the correct command and requires only a few keystrokes.

Delete. The last of the DOS editing keys is delete. This one is the logical antithesis to insert. Pressing delete causes DOS to skip over one character position in the template without sending that character to the command line.

The delete key's primary use is in eliminating double keystrokes or superfluous characters. For example, if you attempt to enter

```
A>COPY B:\USR\FRANK\MEMO\TEST
    A:\USR\ALAN\MEMO\TEST
```

but mistakenly spell ALAN with two *L*s, so that the command line reads

```
A>COPY B:\USR\FRANK\MEMO\TEST
    A:\USR\ALLAN\MEMO\TEST
```

you can, with the help of delete, correct your error with a very few keystrokes.

First, press the F2 key and the *L* key to copy the command line template up to the first *L*. At this point the command line will look like

```
A>COPY B:\USR\FRANK\MEMO\TEST A:\USR\A
```

Note that the template's internal pointer currently points at the first *L* in *ALLAN*. It would be convenient if you could advance the pointer by one position without sending the character at that position to the command line; that's precisely what delete allows you to do.

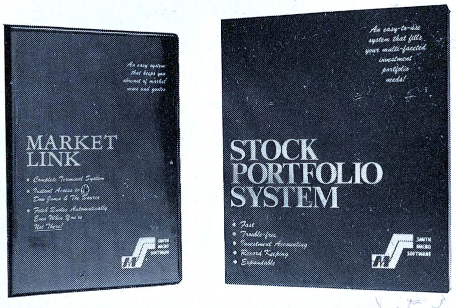
Pressing delete advances the pointer to the second *L*. Finally, pressing F3 copies the remainder of the template, from the pointer to the end of line, onto the command line, thereby entering the correct command.

There's one more thing we need to mention before leaving the subject of command line editing. It's something that isn't well documented in any of the IBM manuals. What happens if you press any other key while editing a command line template?

The answer is quite simple. DOS enters the character associated with the key you press into the command line and advances the template pointer by one character position.

The major drawback of any function-key-driven system is that you have to take the time to learn the meanings of the various keys and their associated actions. However, if you have complex hierarchical directory structures and are tired of entering and re-entering long command lines, you'll find these simple functions well worth learning.

Next time we'll take a look at the intricacies of Edlin. ▲



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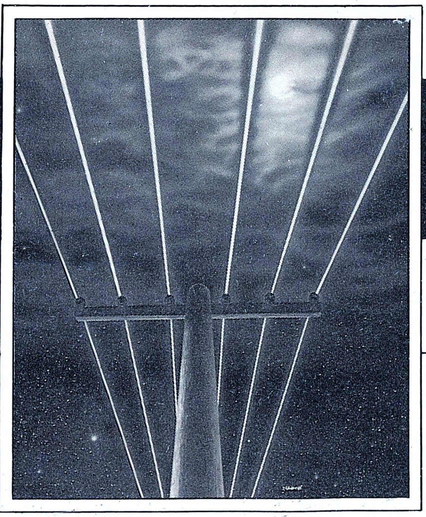

COMM LINES

by Charles Daney and Tom Foth

By George, BiSync!

In last month's column, we saw that asynchronous communications is not the optimal way to transmit bulk data between computers. By bulk data, we mean large volumes of data, as contrasted with the small amount of data that's exchanged between a host and a PC when the PC is emulating a terminal. We further alluded to the fact that there are other data transport mechanisms that are better suited for bulk data transmission. This month we will look at one of them in some detail.

The question we face is: What's the quickest way to transfer a large number of bytes serially from point A to point B without error? The key is to reduce the ratio of error-checking and control information to data. In asynchronous terminal traffic we need to bracket each byte (seven bits) with synchronizing and error-checking information; if we can bracket larger units in our bulk data transfer, we'll have a way to increase the efficiency of the process dramatically.

This is exactly what *synchronous* communications sets out to do. Synchronous communications became possible when computers started talking to one another via intelligent (that is, nonmechanical) devices that were able to buffer, or store, many bits of incoming information (the earliest communications between computers, you'll recall, were done over Teletype machines, which, as mechanical devices, lacked the ability to store significant amounts of data).

A Synchronous Data Packet. In a typical synchronous communications exchange, many bytes of information (typically eighty or more) are bracketed by synchronization characters, data-link control information, and error-checking information. The synchronization characters (also known as *pad, sync, SYN*, or *idle* characters) and data-link control information (information describing the data being sent) precede the data, and the error-checking information follows it. This whole conglomeration—synchronization characters, data-link description, data, and error-checking information—is usually called a *packet* or *block*.

As in asynchronous communications, synchronization between the sending and receiving systems must take place before data can be transacted. Unlike asynchronous communications, however, where the sender and receiver need to maintain synchronization for only a short period of time (a few bits), synchronous systems must maintain synchronization for many bytes of information. To take into account the variances of the communications link that may occur over the duration of a packet transmission, several sync characters are transmitted at the beginning of each packet (contrast this to the single start bit typical of asynchronous transmissions).

The receiving system, in its idle state, is constantly monitoring for sync characters. When it starts receiving bits of any nature, it automatically attempts to adjust itself until it successfully receives some number of sync characters (usually two). Once this has taken place, the receiving equipment is in synchronization with the sending equipment. Many synchronous systems constantly send sync characters so that the receiver is constantly synchronized (and, hence, constantly prepared to receive data) and can constantly determine line quality.

It's because of this character synchronization that special modems must be used in a synchronous environment. It should also be obvious that it takes a lot more intelligence on the part of the modem to synchronize on a character (composed of several bits) as opposed to on a single bit (as in asynchronous communications). For this reason, synchronous modems are much more expensive than asynchronous modems. In the future, this should not be the case, because as LSI (large-scale integration) circuits are created for this purpose, the cost of synchronous modems will come down. Even with today's cost of synchronous modems, the savings of time and accuracy realized in doing bulk data transmission synchronously usually make an investment in synchronous communications a bargain.

Once synchronization has taken place, the receiving system looks to receive information that describes the data being transmitted. This information is known as the data-link control information. Data-link control bytes vary from system to system; a discussion of this topic is beyond the scope of this article.

Missing an installment of "Comm Lines"? The current column began in July 1984, but all back issues of the column—from June 1983—are still available; for further information, see page 4.

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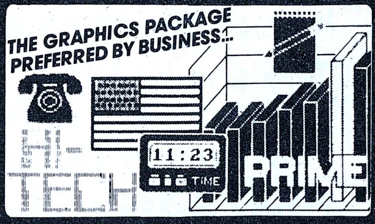
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Following the data-link control bytes are the actual data bytes to be sent between the two systems. The format of these bytes is not critical; they can be truly binary information, ASCII characters with or without parity (as we will see, the parity is redundant), or EBCDIC.

Following the data portion of the packet, there may be a byte that indicates the end of the data portion of the packet and the beginning of the error-checking information. Some synchronous systems transmit the length of the data portion of the packet in the data link control bytes and hence do not need this delimiter.

Error checking also varies from one synchronous discipline to another. The common methods are checksum, longitudinal redundancy check, and cyclic redundancy check.

A *checksum* error code is derived by adding together the binary values of all of the data bytes. Usually only a portion of this sum (the least significant one or two bytes) is transmitted. Of all of the popular block checking methods, checksum is the most likely to allow the occurrence of undetected errors.

Longitudinal redundancy check (*LRC*) can be thought of as a parity check spread over many bytes. To compute an LRC we keep track of the number of 1 bits in each bit position of each byte in a block. LRCs can be odd or even, just as parity can. In an odd LRC, if the number of 1 bits at a given bit position is even, the corresponding LRC bit will be a 1, making the total number of 1 bits odd. Even parity works in the opposite manner.

The following table represents the calculation of an LRC for five bytes:

Bit position→	0	1	2	3	4	5	6	7
Byte 1:	0	0	1	1	0	1	0	1
Byte 2:	1	1	0	1	1	0	1	0
Byte 3:	1	1	1	1	0	0	0	0
Byte 4:	0	0	1	1	0	0	1	1
Byte 5:	1	0	1	0	1	0	1	0
Number of 1s in each position:	3	2	4	4	2	1	3	2
Odd-parity LRC:	0	1	1	1	1	0	0	1

If the data bytes contain a parity bit, LRC can be used to correct some errors involving a single bit. Like normal parity (which is also known as *vertical redundancy checking*), LRC by itself cannot detect double-bit errors. LRC differs from ordinary parity, however, in that an undetectable double-bit error occurs only when the two bits in error are a multiple of eight bits apart. And that's an uncommon event; as we mentioned last month, errors in data communications typically occur on adjacent bits.

Cyclic redundancy check (CRC) is the most popular and one of the most powerful means of error detection. It can detect all errors that affect an odd number of bits, all 1-bit errors that occur in sixteen consecutive bits, and more than 99.9968 percent of all other errors. It is a little-known fact that the PC BIOS routines for the tape cassette interface use CRC.

Simply stated, the CRC method treats all the bits of all the bytes of the packet as a single (large) binary number. This number is divided by a constant, and the remainder of the division (a two-byte, sixteen-bit value) is transmitted as the error-checking value. It is beyond the scope of this article to discuss all of the mechanics of this algorithm; for greater detail, consult the bibliography at the end of the article.

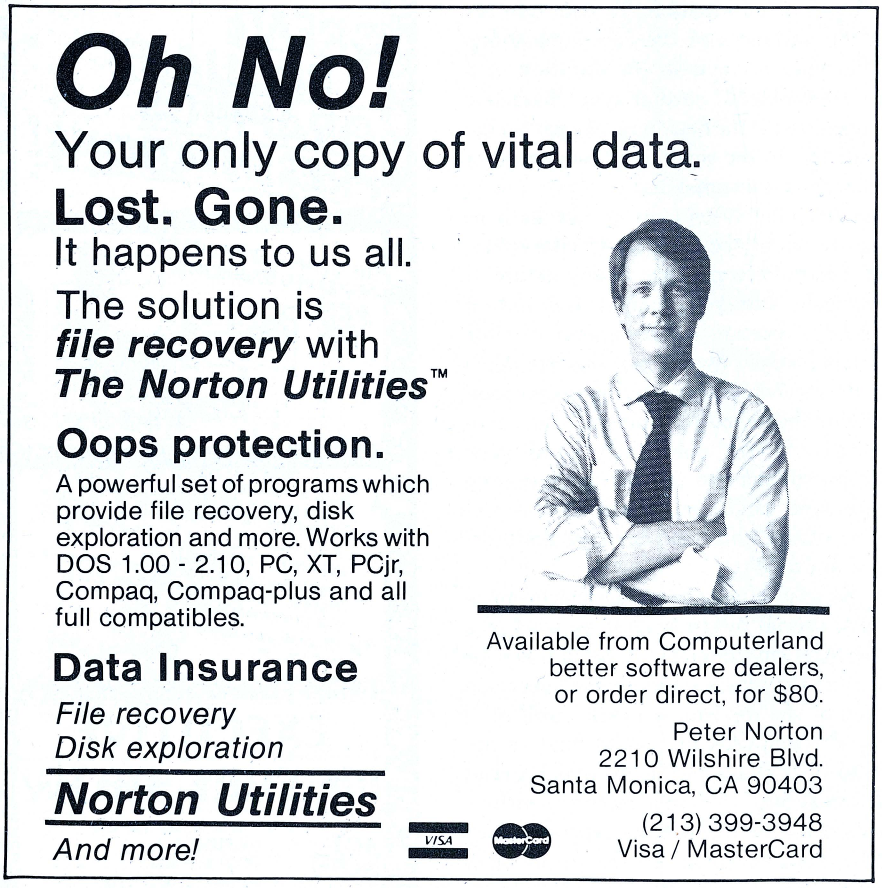
Since each packet in a synchronous communications transaction carries with it error checking for all characters in the packet, it is not necessary that data bytes have parity bits. This allows all eight bits of a data byte to contain data.

Disciplines That Use Synchronous Communications. Many mainframe systems use synchronous communications to converse with other systems and remote devices. In particular, IBM mainframe operating systems are optimized to communicate with synchronous devices. It is for this reason that many PC users find corporate data centers reluctant to get into the hassle of supporting communications to PCs asynchronously.

Many vendors, including IBM, realized that this was a major obstacle to the successful integration of PCs into the corporate mainframe environment. So, to allow PCs to communicate in these environments, interfaces like IBM's Binary Synchronous (Bisync) Adapter and IBM's Synchronous Data Link Control (SDLC) Communication Adapter were developed.

Bisync was IBM's first synchronous communications discipline. It was a very simplistic procedure that first supported bulk communications from IBM mainframes to remote job entry (RJE) workstations. Remember that IBM's first mainframe operating systems were batch oriented; that is, they accepted input almost exclusively from punched cards and produced output almost exclusively on high-speed line printers almost exclusively. RJE workstations, connected to the mainframe by a bisync line, extended the mainframe to remote users by allowing them to locate a card reader and/or line printer at a site distant from the mainframe.

As IBM started to support CRT terminals (for example, the 3270 family) and mainframe-



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to-mainframe communications, bisync was again pressed into service. Soon, the overhead entailed by bisync's requirement that the mainframe constantly "ask" each device if it had information for the mainframe and that the remote device acknowledge receipt of each packet started to impact network performance. Further, many IBM communications products had "adapted" bisync to their own needs, and the resulting differences in protocols and procedures had virtually ruled out device concentration (the connecting of several devices to an intelligent control unit, which would arbitrate the use of a single line in such a way as to maximize the utilization of that line)—a feature needed to reduce line costs and complexity in large networks.

To remedy these problems, IBM developed Systems Network Architecture (SNA), a set of standards and protocols that all future IBM communications devices would adhere to. This approach sought to maximize connectivity by minimizing the differences in communications between any two communications products. Also, since all communications products would use common protocols, it would be possible to design concentrators that would allow differing devices to share a common communications line.

SNA used a synchronous line discipline known as Synchronous Data Link Control (SDLC). SDLC is modeled after a standard developed by the International Standards Organization (ISO, a group of representatives from vendors who provide international standards for various industries) known as HDLC—High-Level Data Link Control.

For this reason there are two types of synchronous communications adapters for the PC: the bisync adapter to use in bisync mainframe connections (there are still many bisync networks) and the SDLC adapter for use in SNA/SDLC networks. Both allow the PC to emulate a 3270 terminal or an RJE workstation. We will look at the capabilities of these adapters in a future installment of this column. ▲

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TRADETALK

Δ **Northeast Expositions** (Chestnut Hill, MA) has merged the two Softcons planned for spring and fall 1985 into a single event to be held in Atlanta, at the Georgia World Congress Center, March 31 through April 3. Explained Bill Mahan of Northeast Expositions, "Given the huge oversaturation of computer shows today, we felt it was in the best interest of Softcon and the software industry to focus on a single, annual spring event rather than diffuse it across multiple shows."

Δ **Lotus Development Corporation** (Cambridge, MA) announced a net income of $7.5 million, or 47 cents per share, for the first quarter ending March 31; this compares with net income of $1.1 million in the first quarter of 1983. In 1983, Lotus's first year of operation, the company reported net income of $14.3 million, $1.02 per share, on net revenues of $53 million.

Δ **CASE** (Computer and Systems Engineering, Watford, England) has completed its acquisition of U.S. data communications manufacturer **Rixon** (Silver Spring, MD). The deal, valued at approximately $27 million net of Rixon's cash balances, was financed by the placement of 3.5 million additional shares in CASE on the London Stock Exchange. Rixon has been a manufacturing licensee for CASE's DCX range of networking multiplexers since 1977. Δ Rixon and **Microstuf** (Atlanta, GA) have agreed to include Microstuf's *Crosstalk XVI* data communications software with Rixon's PC212A card modem.

Δ **Persyst** (Personal Systems Technology, Irvine, CA) has merged with **Emulex** (Costa Mesa, CA). One of the first steps taken after the merger agreement was signed was the establishment of a joint, corporatewide sales organization. Δ Persyst has signed a contract with the **Washington Library Network** (Olympia, WA) to integrate Persyst multifunction cards, multiple protocol controller boards, color display adapter cards, and PC/3270 software into several hundred PCs. This will enable libraries throughout the western United States to have access to a master bibliographic database established and maintained by the Washington Library Network.

Δ The state of Georgia is considering passage of a Software License Enforcement Act geared toward halting software piracy. The bill states that if a party acquiring software uses it or merely opens the package, he or she will have accepted the terms of the software publishers. The Louisiana and California state legislatures are considering similar bills. Δ **The Southeastern Software Association**, a professional trade organization serving the software industry, has been launched in Atlanta by local professionals and manufacturers. The organization was formed to provide a clearinghouse for business and technical information, says steering committee member John Yates of the Atlanta law firm of Vaughan, Phears, Hardy, Roach, Davis and Murphy. The association will also provide networking opportunities for members and will encourage software development in the southeastern United States.

Δ **Tallgrass Technologies** (Overland Park, KS) has selected **MAI/Sorbus Service** (Frazer, PA) to supply nationwide service support for Tallgrass's hard disk drives and tape storage systems. The agreement provides for depot services and on-site support to Tallgrass customers directly from the nearest Sorbus repair center in major U.S. metropolitan areas.

Δ **Computerworks** (Westport, CT), which supplies computer hardware, software, service, and training to corporations and professionals in the New York metropolitan area and Connecticut, has acquired $5 million in venture capital to finance nationwide expansion of its corporate sales, service, and retail operations.

Δ **Schuchardt Software Systems** (San Rafael, CA)—publisher and marketer of *InteSoft*, a line of integrated business applications software—reported losses of $746,015, or 46 cents per share, for its second fiscal quarter ending March 31, 1984. Frederick Schuchardt, president, said the losses resulted primarily from continued aggressive product development and marketing.

Δ The industry's first one-year warranty for a software system has been announced by **Champion Software** (Lakewood, CO) for its business accounting packages. If a purchaser's software performs in a manner inconsistent with the capabilities described in the user manual, Champion will correct the defect, provide replacement software, or issue a complete refund to the purchaser.

Δ **National Memory Systems** (Livermore, CA), a producer of mass storage subsystems for IBM and TI microcomputers, has named **Cindy Pierce** to the post of vice president of corporate administration. Pierce was previously in charge of international sales for Spectra Logic Corporation in Sunnyvale, California. ▲

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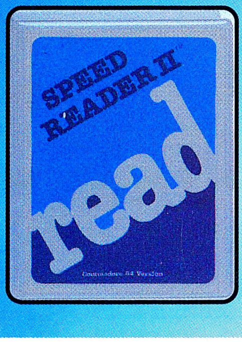

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A REVIEW OF THE 'NEW' OKIDATA PRINTERS

FIRST YOU PLUG, THEN YOU PLAY

by John Dickinson

By changing two of its printers' PROM chips, the Okidata Corporation has produced the first printers that deserve to be called IBM plug-compatible. These printers function exactly like IBM's PC printers and solve the printer compatibility problem that has existed since the PC's introduction three years ago.

What printer compatibility problem?

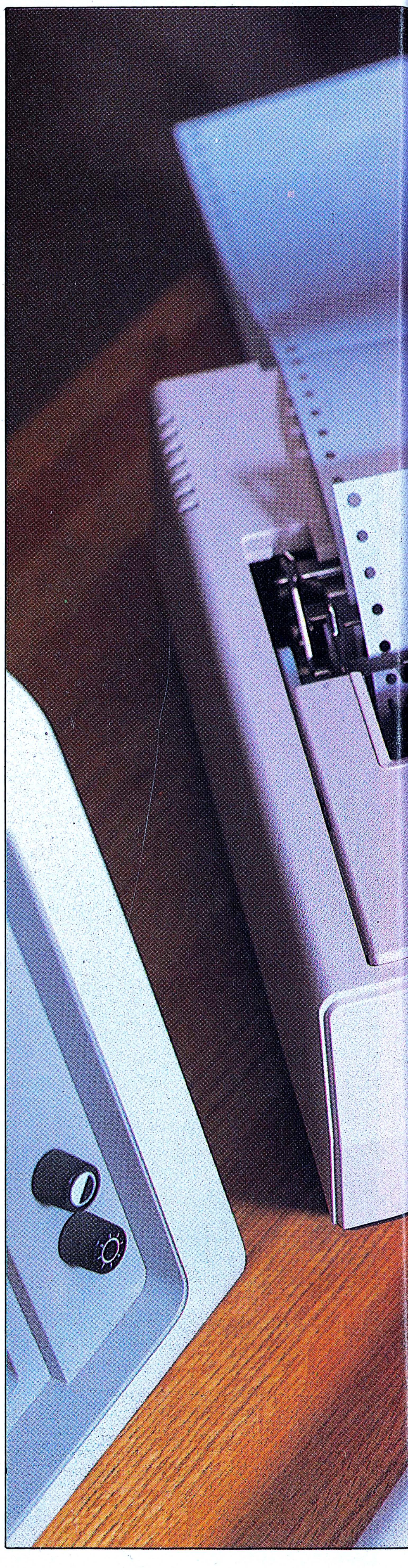
An almost overwhelming number of printers are compatible enough to be physically attached to PCs to operate well enough to print. Many of them have just as many features (or more than) as their IBM counterparts and perform just as well; but none of them functions *exactly like* IBM's own models, and none can be used as easily as other, truly plug-compatible, PC components.

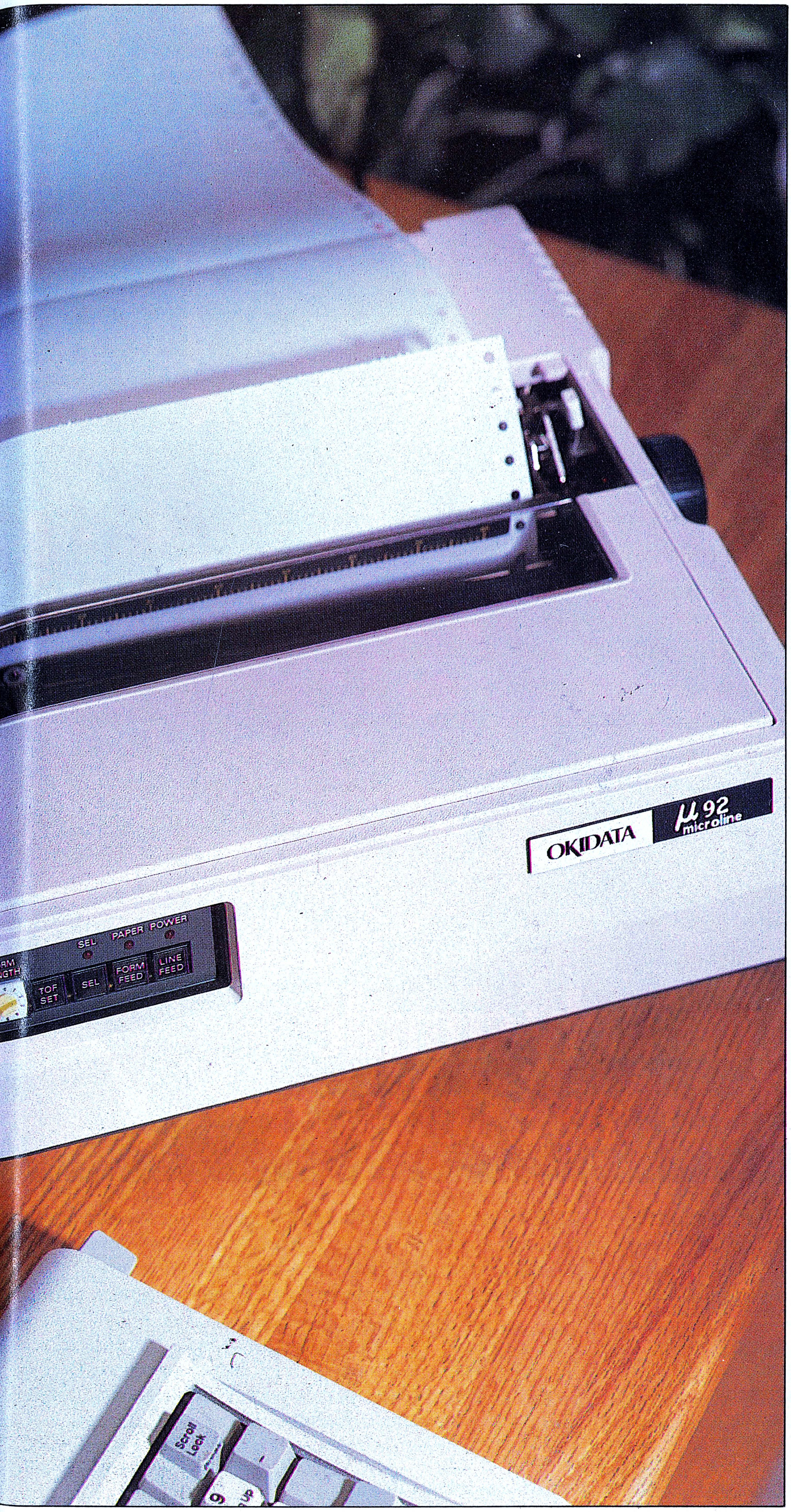
Plug-compatible products for the PC are designed to function exactly the same way as the components they replace. That means that if you remove an original IBM component from your PC and install a plug-compatible one made by another company, *nothing* about the way the computer operates should appear to change; any physical differences between the components should be functionally transparent.

This standard of plug-compatibility is often met in such products as video displays, memory chips and boards, and even in something as complex as disk drive controllers. Furthermore, many plug-compatible PC products offer added benefits to the user. These benefits, which can include lower cost, better performance, and more features than the corresponding IBM components, are usually the result of creative product design and lower production costs.

PC-compatible printers, however, have been a different story. Replacing IBM's PC graphics (or older-model matrix) printer with a compatible printer made by another vendor has not usually produced the degree of functional transparency that swapping memory chips has. Compatible printers don't generally function exactly the way IBM models do; as a result, any extra features they may have may be difficult, or even impossible, to use.

Most ASCII printers on the market are plug-compatible with the PC only in the sense that they can be plugged into the computer's parallel printer adapter or serial port and will





respond to simple print commands from most software products. That just means that they'll faithfully print the ASCII alphanumeric character set based on the seven-bit TTY timesharing standard (ASCII characters 32 through 126) and are capable of doing line feeds and form feeds.

That's where compatibility with IBM's PC printers begins and ends. Most non-IBM printers will not print characters in the PC's extended ASCII character set, which includes the text graphics characters often used for screen formats, nor will they respond correctly to most of the command sequences used to enable and disable IBM printer features. Many, for example, will not switch to compressed printing in response to the DOS *mode* command.

Users and software authors alike have been frustrated by this situation. Users can have a difficult time getting software to take advantage of their printers' special features, and authors bear the awesome burden of trying to support a seemingly unending variety of command sequences and character sets.

Epson and Epson-compatible printers have been a partial exception to the foregoing. They respond correctly to most (but not all) IBM command sequences but cannot print the PC's extended character set. This is mostly because IBM matrix and graphics printers are made by Epson, and their command sequences, but not their character sets, are based on Epson designs. (Old-time PC users might remember that the original IBM matrix printer used the Epson MX-80 character set, not the PC's.) IBM's new color printer, which is not manufactured by Epson, uses the same character set and command sequences as the IBM graphics printer, along with other commands that enable its added features.

Until recently, however, Okidata's Microline printers have *not* been an exception. They use character sets (outside the seven-bit range) that are not compatible with the PC's, and the command sequences used for special printer features are unique to Okidata. This has been particularly frustrating for Okidata owners; many bought the attractively priced printers because they offer better performance and more features than IBM's printers, but they have found these features difficult to use.

But now, product designers at Okidata have done something to make it easier for the PC user to get along with his printer; and they've done it well. The Plug 'n' Play option for the Okidata Microline series changes the printers' internal computer program to produce the entire extended PC character set and to respond to all IBM printer command sequences, including graphics; the modified Microlines are the first (and, for now, the only) non-IBM printers to offer the type of functional transparency that defines plug-compatibility for PC components.

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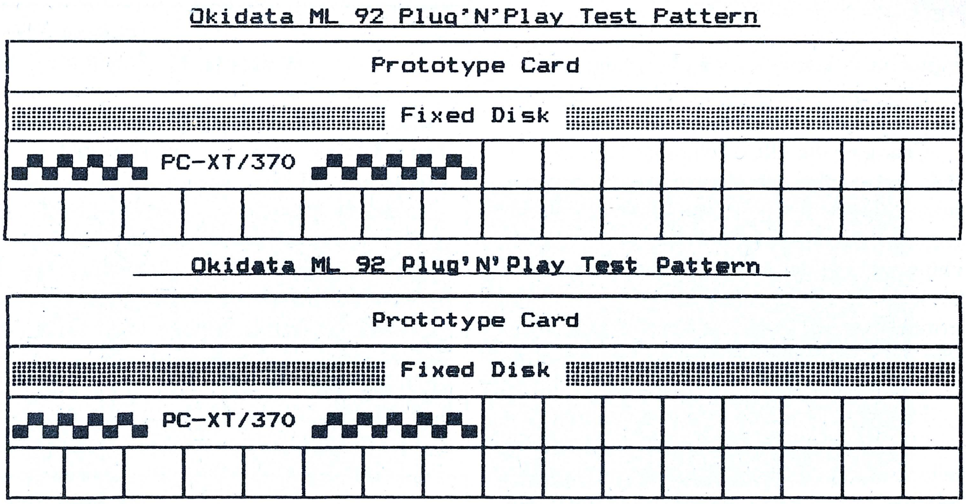

Okidata ML 92 Plug'N'Play Test Pattern

Prototype Card

Fixed Disk

PC-XT/370

Okidata ML 92 Plug'N'Play Test Pattern

Prototype Card

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The figure at top was produced on the IBM Graphics Printer; the one below was done on an ML 92 equipped with Plug 'n' Play. The way the latter machine handles hardware underlining codes may sometimes result in unwanted underlined blanks. Note, however, that the Okidata produces truer vertical strokes (both printouts were made bidirectionally).

Like other types of plug-compatible components, Okidata printers equipped with Plug 'n' Play have a couple of extra features and come at an attractive price. A Plug 'n' Play-equipped Microline 92, for example, provides correspondence-quality printing and single-sheet paper feeding in addition to its plug-compatible capabilities. The machine is rated to print at 160 characters per second, which is double the IBM PC graphics printer's speed rating, yet its cost ($599) is the same as the IBM model. Other Plug 'n' Play models are also attractively priced and print at up to double the speed of the IBM models they replace (see table 1 for details on models, prices, and features).

Plug 'n' Play is available to current Microline owners as well as to buyers of new printers. If you already have a Microline, you can buy a kit that includes two PROM chips containing the printer's computer program as well as guides to installation and programming. The kit can be installed by you or your dealer.

Buyers of new Microlines can get a printer with Plug 'n' Play installed at the factory for the same price they'd pay for the standard model. Or, if they need some of the features of the unmodified Microline, they can buy a standard model with a separate Plug 'n' Play kit (table 2 lists Microline features not available when Plug 'n' Play is installed).

The following review is of a standard Microline 92 printer with a separate Plug 'n' Play kit. The ML 92 is a standard-width (9 1/2-inch) printer with a rated speed of 160 characters per second; it's usually considered competitive with Epson's 160 cps FX-80. At $599 for the parallel version ($698 for serial), the ML 92 costs about $100 less than the FX-80.

Unpacking and hooking up the ML 92 is no problem. Okidata's quality assurance people test each printer domestically (the printers are manufactured in Japan) before shipping, and it's a rare one that doesn't work right out of the box. Like most other matrix printers, the Microline is easy to set up.

Okidata deserves an award for "most improved printer documentation of the year." Okidata printers once arrived with a thin pamphlet that didn't help much when it came to operating the printer or using its command sequences; Microline buyers now get a thick loose-leaf binder containing the *Okidata Personal Printer User's Manual*. The new manual clearly covers everything you could possibly want to know about the printer.

Packed inside the Plug 'n' Play kit box, alongside the PROM chips, is still more good documentation (formatted to fit in the loose-leaf binder). The *Plug 'n' Play Instruction Book* shows how to install the chips and documents the printer's new command sequences. The *Plug 'n' Play Note Book* offers tips on how to use the printer with several popular software packages.

Installing the Plug 'n' Play chips is simple. The printer's cover comes off easily, and removing the printer's system board (you don't have to do this on some models) requires only a few twists of a Phillips screwdriver. The system board, which is a little larger than a standard PC expansion board, is held in by two captive screws (screws that can't be dropped or lost when loose).

The only step in the installation procedure that you might find complicated is unhooking the seven (seven!) separate cables attached to the system board. Okidata advises wrapping each cable with a piece of tape so you know where to put it back, but in fact there's only one way to reattach each cable; so it's not really necessary to mark them. All but two of the

Microline models	ML 84	ML 92/93	ML 82A/83A
Prices:			
Standard model	$1,395	$599/$999	$349/$749
With Plug 'n' Play	same	same	not available
Plug 'n' Play kit	$89.95	$49.95	$39.95
Equivalent IBM model	Graphics	Graphics	Matrix
Paper-feed mechanicsm	roll & tractor	pin & roller / roll & tractor	pin roller/ roll & tractor
Correspondence quality	yes	yes	no
Graphics-capable	yes	yes	no
Rated speed	200 cps	160 cps	120 cps

Table 1: Okidata's Plug 'n' Play lineup. The ML 92/93 and ML 82A/83A are equivalent standard/wide carriage models. The ML 84 has a wide carriage. Prices shown are for the ML 92/93 or for parallel models; add approximately $100 for equivalent serial models. The ML 84 also requires a cable, which is sold separately for $49.95. The ML 82A/83A is not graphics capable; it is, however, available with the Okigraph option (without Plug 'n' Play).

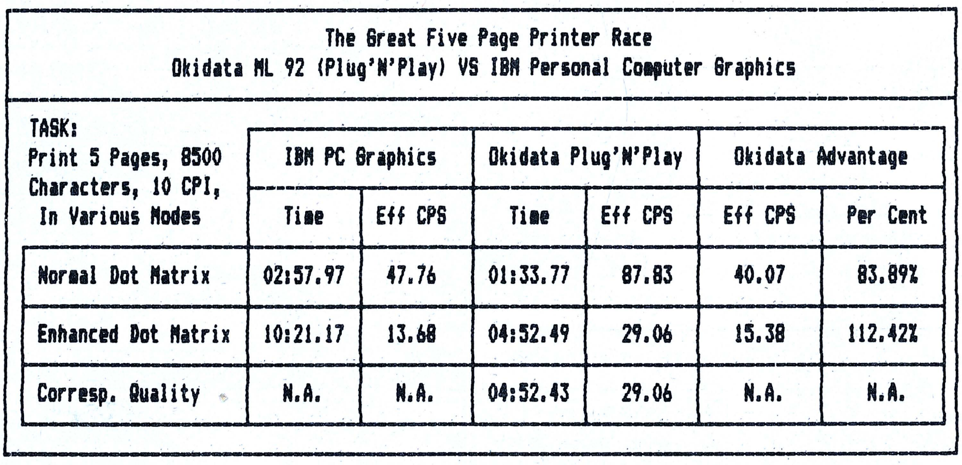
Nota Bene—

Plug 'n' Play changes Microline printers to make them compatible with IBM PC matrix or graphics printers, and *not* Epson printers. Epsons and IBMs are mostly, but not totally, compatible printers.

Retail and mail order dealers frequently make the error of thinking Epson and IBM printers are fully compatible and have carried that error into their marketing of Okidata's Plug 'n' Play option.

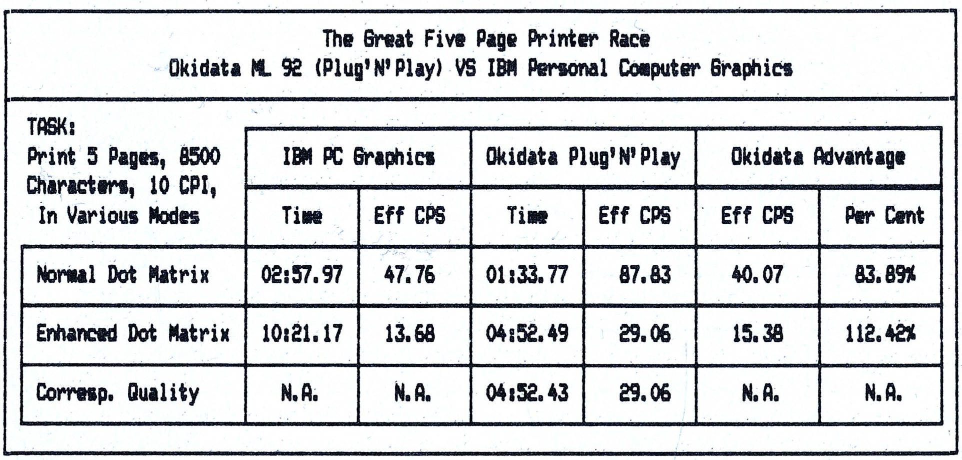
If you use a Plug 'n' Play-equipped Microline as an Epson printer, variable line height will not work correctly, and graphics programs consequently will not work well. The Epson's italic characters will not be available; nor will the printer reset feature and some other Epson options.

Okidata has made every effort to label its product properly, but dealers and users alike have often had problems because they've used Plug 'n' Play as an Epson. If you call Okidata's technical services staff about a problem, don't be too surprised if they ask you if you're using their printer to emulate an Epson; that's the first thing they check for. ▲



The Great Five Page Printer Race
Okidata ML 92 (Plug'N'Play) VS IBM Personal Computer Graphics

TASK: Print 5 Pages, 8500 Characters, 10 CPI, In Various Modes	IBM PC Graphics		Okidata Plug'N'Play		Okidata Advantage	
	Time	Eff CPS	Time	Eff CPS	Eff CPS	Per Cent
Normal Dot Matrix	02:57.97	47.76	01:33.77	87.83	40.07	83.89%
Enhanced Dot Matrix	10:21.17	13.68	04:52.49	29.06	15.38	112.42%
Corresp. Quality	N.A.	N.A.	04:52.43	29.06	N.A.	N.A.



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Enhanced Dot Matrix	10:21.17	13.68	04:52.49	29.06	15.38	112.42%
Corresp. Quality	N.A.	N.A.	04:52.43	29.06	N.A.	N.A.

The Okidata ML 92, equipped with Plug 'n' Play, is a speedier machine than the IBM Graphics Printer. It's also significantly neater in bidirectional mode. The chart at top was printed on the IBM, the one below on the Oki; note the broken horizontal lines and the wavy verticals on the IBM's output.

cables have different-sized plugs, and the two with the same sized plug can't be interchanged because they have different wire lengths.

Changing the PROM chips isn't difficult, either, but it's the one place where the instructions might lead you astray. Okidata suggests using a small-blade screwdriver to pry the old chips out, but doing this could easily damage some of the surrounding components on the printer's system board. It's probably a better idea to hop down to your local electronics shop and spend $2 on a chip puller.

Finishing up is easy. Markings on the Plug 'n' Play chips clearly indicate which slots they belong in, and pushing them into their sockets requires only a small amount of manual dexterity. The system board slides easily back into the printer, and the cables just about fall onto their proper plug positions. Not counting a trip to your electronics shop, the entire project should take you about ten minutes.

There are a few physical differences between the Okidata ML 92 and the IBM graphics printer. The ML 92 is a little narrower and taller, for example. At twenty pounds, it's also nearly twice as heavy as the twelve-pound IBM. Okidata printers have always used larger components than printers made by Epson; these give the Okidatas greater durability and better print quality, but at a cost in weight.

Part of the weight penalty comes from the Okidata's use of a roller for feeding paper, which is heavier than the IBM's Epson-designed tractor feed. The ML 92's roller is of the pin-feed variety, which means it can either be fed continuously, with continuous-form tractor paper, or use single-sheet paper. The ML 92's wide carriage twin, the Microline 93, uses a separate tractor along with the roller. The separate tractor can be purchased as an option for the ML 92 and is recommended for use with mailing labels and other narrow-form paper.

Downline loadable character generator
12-character-per-inch printing
6-character-per-inch printing
Direct skip to line
Left margin set
Horizontal tab and left margin set by dot column
Set top of form (available on operator's panel only)
Print suppression

Table 2: Standard features not available on the Okidata ML 92/93 with Plug 'n' Play installed.

To compare the Plug 'n' Play-equipped ML 92 with the IBM graphics printer, we hooked both machines to the same cable via a Hadax PC-Mate parallel printer switch. This setup allowed us to repeat the same printing job on both machines without having to unplug and reconnect cables, thereby eliminating any possibility of our disturbing printer settings by moving cables.

To make sure we always asked each printer to do the same thing, we used a Microperipherals Microbuffer. Besides having a 64K print buffer, the Microbuffer has a copy function that permits an exact reprint of the same output. The external buffer also eliminated the possibility of differences in timing brought about by changing PC conditions. No internal software print spoolers were used in the PC.

We started our comparison test by cranking up *EasyWriter II* (with its printer driver table configured for the IBM printer) and proceeding to print out several documents on both machines. Many of the test documents used compressed, wide, emphasized, and double-strike printing, along with subscripts, superscripts, and a variety of vertical line heights and page sizes. There were no problems, but a few differences did show up.

The most noticeable difference has to do with the hardware underlining feature of the printers. The IBM underlines from the first nonblank character on a line to the last one, regardless of where the command sequences for underlining are. If the command sequences are before and after the characters to be underlined, the Okidata underlines starting and ending at the position of the command sequences, which may result in extra underlined blanks before and after the printed characters.

Another minor, but noticeable, difference can be seen in the way the printers form subscript and superscript characters. The IBM does the job with half-height characters that are printed on the upper or lower half of the line; the Okidata forms them using full characters raised or lowered half a line. Unlike the difference in underlining, which you can take care of by changing document print formats, this difference is built into the Okidata's character set and cannot be eliminated. Many people, however, object to the IBM's half-height characters and will prefer Okidata's way of doing things.

An annoying bug in the IBM printer is missing from the Okidata. When certain command sequences (subscript, superscript, and underline) are used within a printed line, the IBM refuses to change line heights on that line. It waits until after the next line to make the change. Okidata designers either fixed the bug or didn't notice it in the first place.

We ran tests with other software products and turned up no other differences in the printers' responses to command sequences. Print quality was about the same for both printers

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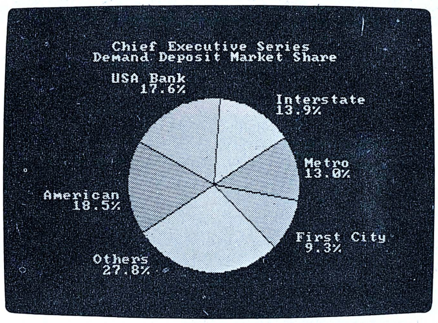

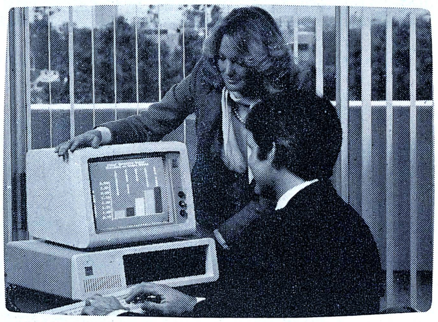

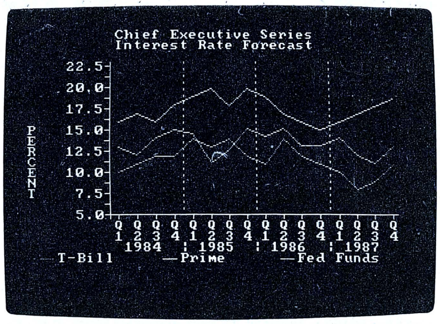

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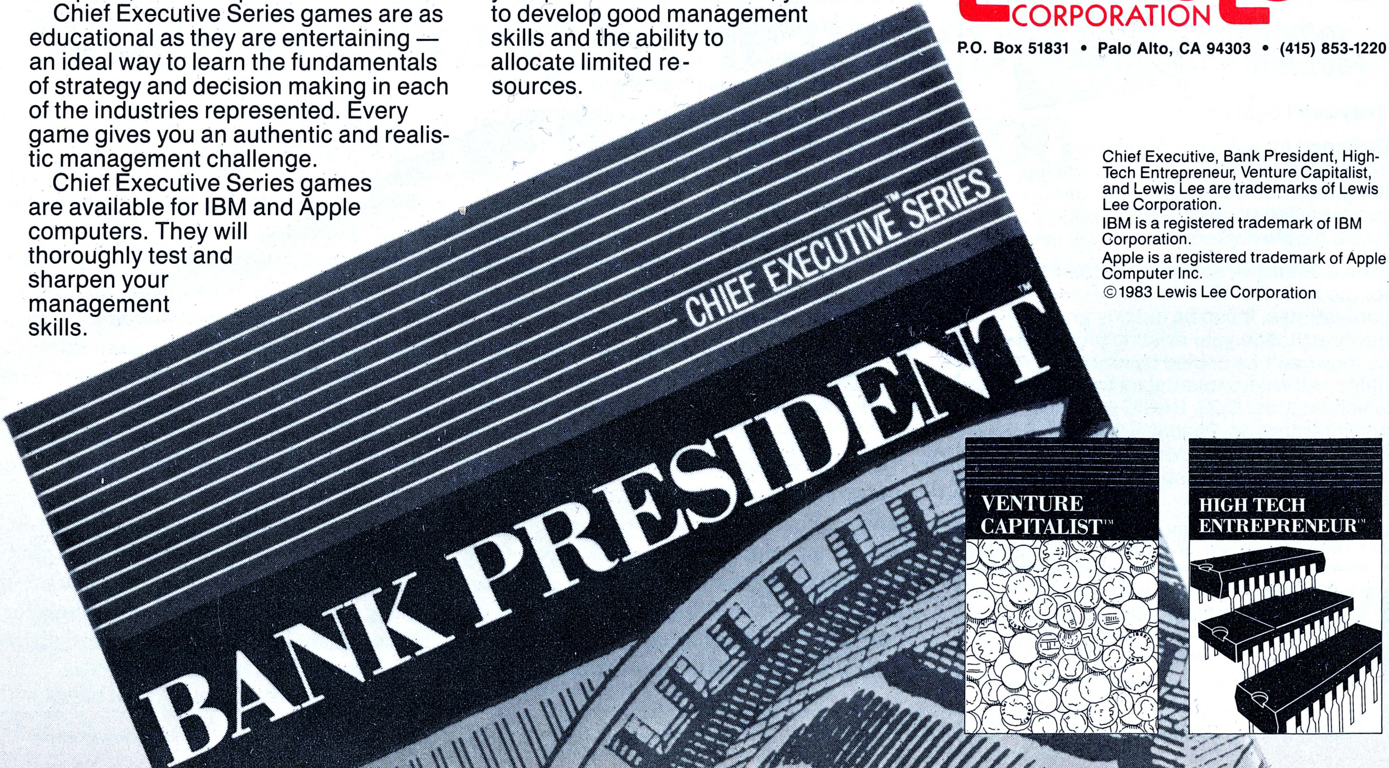
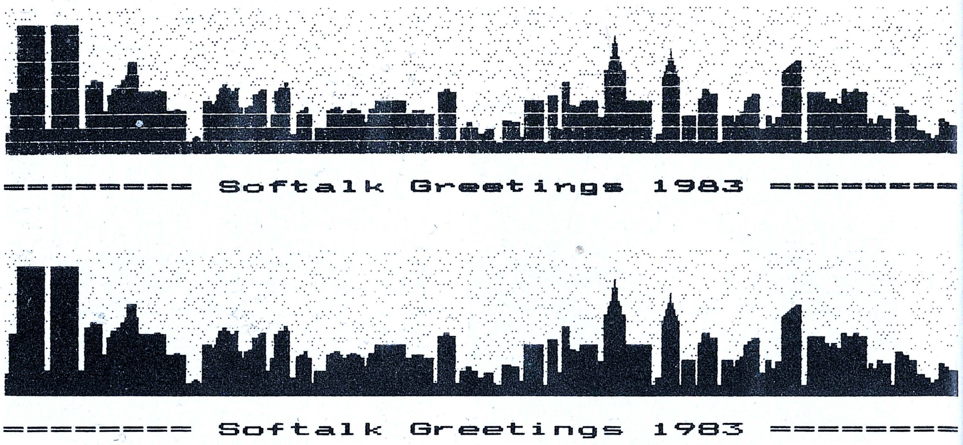


for all tests using the standard printable character set and IBM print enhancement features, but when we went beyond that, the Okidata proved to be a printer of superior quality in all but one respect.

To get a better look at how the Okidata and IBM compare in print quality, we output some diagrams that use the PC's text graphics characters in combinations to make squares and rectangles of various sizes, and shading characters to distinguish various areas from one another.

When we originally produced these diagrams on the IBM printer, it was necessary to use unidirectional and emphasized printing to ensure that the vertical lines would appear perfectly straight (the characters align well, but the IBM print head tends to wobble, which makes individual matrix dots print out of line). The Okidata faithfully reproduced the diagrams using the identical file originally made for the IBM printer. We then removed unidirectional printing and watched the vertical lines print out perfectly straight on the Okidata. Removing emphasized printing didn't change things either. The Okidata's heavier print mechanism is undoubtedly responsible for keeping the matrix dots perfectly lined up at all times.

Further experimentation with the diagrams revealed that another IBM printer bug has been at least partly removed in Okidata's Plug 'n' Play chips. When printing a line containing text graphics characters, the IBM will not allow any command sequences that change printing characteristics (it inserts a line feed and ruins the output). That means, for example, that hardware underlining can't be used on a line with graphics characters. The Okidata, on the other hand, allows underlining, superscripts, and subscripts on the same line with text graphics characters. Neither printer allows a change in character width.


======== Softalk Greetings 1983 ========
======== Softalk Greetings 1983 ========

In graphics mode, the Okidata (top) leaves horizontal white streaks. These are a consequence of a difference in step distances used for vertical line feeding.

Printing the diagrams and some more normal-looking text using the Okidata's correspondence-quality enhancement was a pleasure. While the correspondence-quality printing is clearly distinguishable from the output of a letter-quality daisy-wheel printer, it is also distinguishable from, and much easier to read than, standard matrix fare. The Okidata's correspondence quality offers a reasonable alternative to buying a second printer for higher-quality printing.

The only disappointment with correspondence quality is that it is not available for compressed- or compressed-wide-mode printing. Correspondence quality is also not available for the text graphics characters. However, Okidata's design cleverly allows those characters to be printed in emphasized and double-strike modes at the same time regular characters are printing in correspondence quality. Since the correspondence-quality characters print darker than normal, this combination results in an even level of print density.

Okidata's Plug 'n' Play graphics are fully compatible with IBM's, and the manual includes a complete explanation of how the different graphics modes work (something IBM might think about including in their manuals). The DOS 2.0 *graphics* command hooked up correctly, as did some BASIC programs. For example, the Christmas card graphics program from the December 1983 installment of "The Printed Word" worked perfectly.

The IBM graphics output is of better quality than that from the Okidata, and that's a disappointment. The problem is that the Okidata leaves fine, but noticeable, horizontal white streaks across the paper. Okidata's technical staff says that this problem is due to the difference in step distances used for vertical line feeding. Because IBM steps in 216ths of an inch and Okidata steps in 144ths, there's no way to make the graphics appear identical.

And then there's speed. Rated speeds don't always give a true measure of printer performance, so we ran a few more tests. We raced the printers using a typical text document. To keep things reasonable we chose a document that's only five pages long and contains about eighty-five hundred characters (including printer command sequences). We printed the document in normal matrix mode and enhanced mode, with emphasized and double-strike printing enabled. We also tried it out on the Okidata in correspondence-quality mode.

The Okidata's effective speed proved to be just about twice as fast as the IBM's, almost exactly in line with the difference in their rated speeds (see table 3). Because of its slightly faster paper-feed rate, the Okidata is *more than* twice as fast when print enhancements are in use. Correspondence quality on the Okidata prints at the same speed as combined emphasized and double-strike printing.

Plug 'n' Play-equipped Okidata printers are, by anyone's definition, truly plug-compatible with IBM printers. The differences between them are few and trivial, mostly favoring the Okidata.

The Okidatas are excellent values, too. ML 92 buyers get a very durable printer with twice the effective print speed, correspondence-quality printing, and single-sheet feeding for the price of an IBM graphics printer. Prices of other models are equally favorable. ▲

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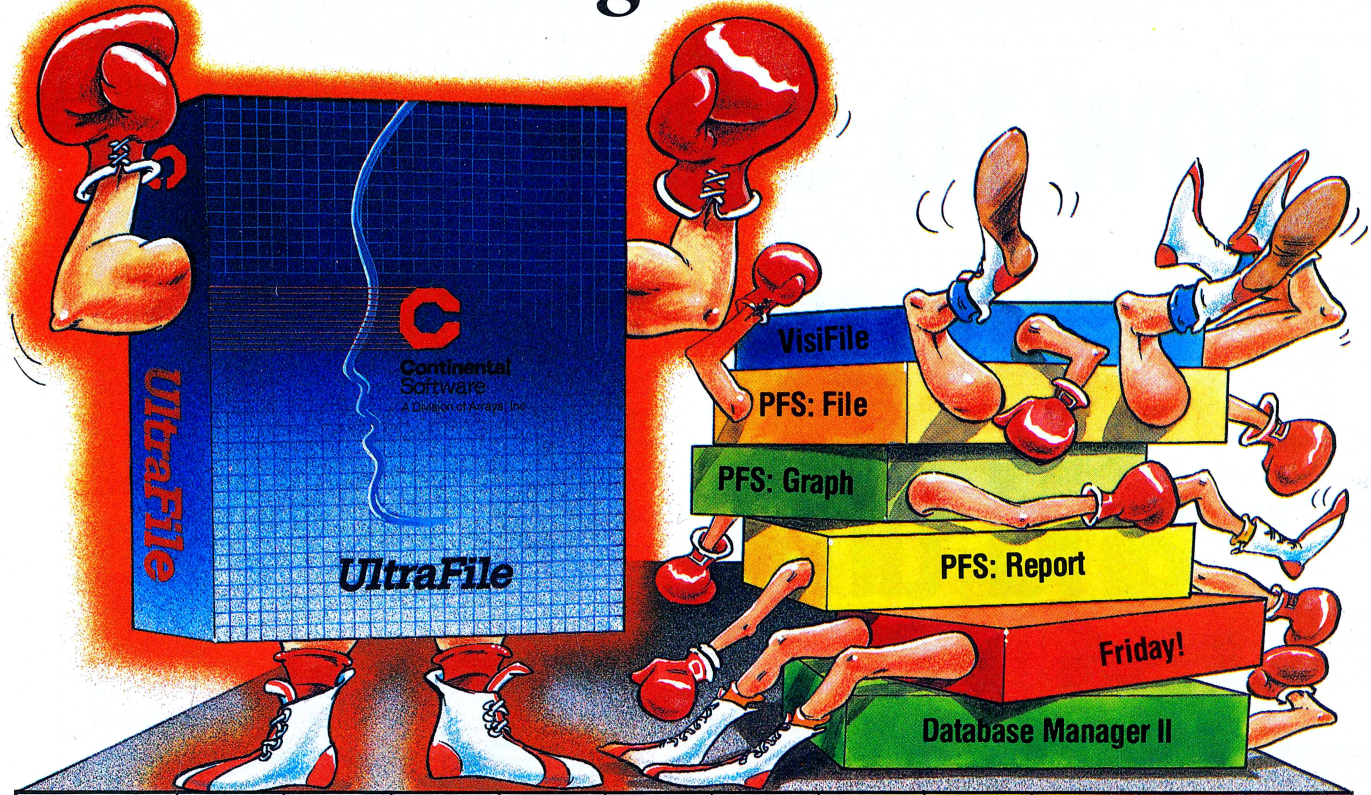

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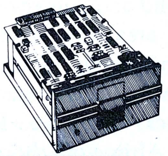

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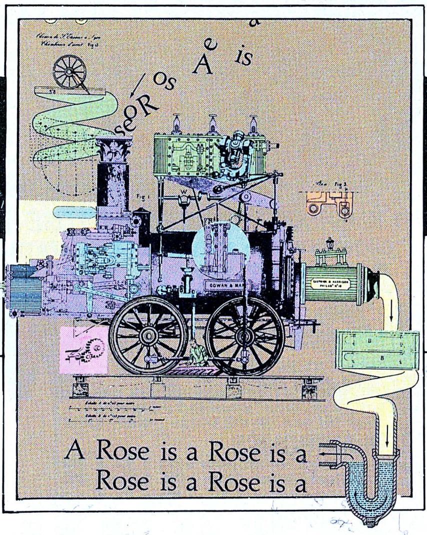
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by Terry Tinsley Datz and F. Lloyd Datz

Microsoft *Word*

W*ord* is a story of mice and menus, of how Microsoft put the two together and came up with a word processor that's quick on its feet, fairly easy to learn, and, well, sort of fun to use.

Is the mouse really all that helpful with word processing? You bet. Maybe not when you're in the typing phase, but for reorganizing and revising, it can't be beat. Like Zen, it just asks you to point. And by pointing, you can do many word processing chores—move the cursor, scroll through your document, enter commands, define blocks, open and close windows—with a minimum of keystrokes and without memorizing complicated key sequences.

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VISA

Mice come in two species, optical and mechanical; Microsoft's mouse is mechanical. It rolls on what looks like a giant ball bearing, the rotation of which translates into units of distance called *mickeys*. The mickey count determines where and how far the mouse pointer moves on your screen. Optical mice, on the other hand, have no moving parts but slide over a specially designed grid that keeps track of their movement. They're more reliable than the mechanical variety but less precise.

If the mouse makes *Word* approachable and fun to learn, it also makes the program appear deceptively lightweight. But don't be fooled. Scratch *Word*'s friendly exterior and you'll find a complex word processor, one that handles the most demanding formats with ease, has the truest on-screen formatting in the business, and is precise enough for phototypesetting. And, don't forget, *Word* does windows.

Overall Design

Word works fine on a monochrome display, but it's at its best on a color/graphics monitor. Taking advantage of high-resolution graphics, it displays—in addition to the usual underscore and boldface—italics, superscripts and subscripts, small capitals, double underlining, and strikeout. If you have a Hercules graphics card installed, your monochrome monitor can show you the same goodies. Something else you can do with the Hercules card is squeeze more text on the screen: ninety characters by forty-three lines instead of the usual eighty by twenty-five.

How the mouse pointer looks on-screen depends on the type of monitor you're using. On a monochrome display, the pointer's always a blinking square. Since the cursor is also a square, though a nonblinking one, you might at first find it hard to tell which square belongs to the mouse and which to the cursor. This isn't a problem with a graphics monitor, however, because the mouse pointer takes on different shapes, depending on whether you're using it to move the cursor, scroll, open windows, or enter commands.

Although *Word* may be used without the mouse, buying the program minus the mouse is like ordering vanilla ice cream at Haagen-Dazs. If you insist on using it sans mouse, you enter commands by hitting the escape key to move the cursor from the text area to the menu area and then either typing the first letter of the command or moving the cursor through the menu until it's over the command you want. Pressing the return key carries out the command and puts the cursor back in the text-entry area. The mouse streamlines this process considerably: You just put the pointer on the command you want, then press and release (click) the mouse's left "ear."

After you choose a command from the main menu, *Word* usually offers one or more subcommands. For example, to load a file into the editing screen, you choose the *transfer* command from the main menu, followed by the *load* command from a submenu. In this case, you can speed things up by pressing the right mouse button to choose *transfer* and *load* at the same time. In fact, in many cases you can speed things along with the right button by entering two commands with one click.

Text Entry and Editing. *Word*'s editing screen is a busy one. It's partitioned into two areas, one for entering text and the other for entering commands. The text window is bordered by double lines that, as we'll see shortly, are chock-full of mouse-sensitive spots. The top border of the window converts into an optional ruler line; on the left border is a short horizontal line, called a *thumb*, which indicates your approximate location within your document. When the thumb rests midway between the top and bottom of the window, for example, you know that you're somewhere near the middle of your document. Running vertically just inside the left border of the text window is a style bar that displays page breaks and, if you want them, special formatting codes.

The command area consumes the bottom four lines of the screen. Two of these lines are

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devoted to a menu with options that change, depending on which part of the program you're in. The main menu, for example, has seventeen alphabetically arranged commands, including *copy, delete, format, help, print, quit,* and *replace*. Below the menu is a message line that tells you what to do next or what you've done wrong. The last line shows the name of the current menu and the active file, the percentage of memory that's free, the page number you're on, and other helpful tidbits including indicators for the caps-lock, num-lock, and scroll-lock keys. Nowhere to be found, however, are numbers indicating the cursor's column and line position; there's a method behind this madness, as we'll see.

You can control the cursor with either the keyboard or the mouse. In most cases the mouse is faster: Just put the pointer on the spot you want the cursor to jump to and click the left button.

If you choose to move the cursor via the keyboard, you use the arrow keys plus home and end. Various combinations of these keys move you by character and line, to the beginning and end of the line, and to the top and bottom of the screen (or window).

Scrolling through your document is something you definitely want to do with the mouse. By positioning the mouse pointer on the scroll bar, located between the double lines at the left of the screen, you can scroll anywhere in your document—and fast. Microsoft calls this process *thumbing*, since it's like thumbing through a book. To thumb to the beginning of your file, for example, you put the pointer at the top of the scroll bar and click both buttons. To jump to the middle of the file, put the pointer halfway down the border and click.

Scrolling shorter distances is also just a matter of positioning the pointer in the scroll bar; the difference is that you click only one of the mouse buttons. To scroll up, say, eight lines, you put the pointer eight lines from the top of the screen and click the left button; the right button scrolls in the opposite direction. The lower border of the screen contains another scroll bar, this one for horizontal scrolling.

If you're committed to the keyboard, or if you're operating minus the mouse, you can scroll by screenful, to the top and bottom of your file, and horizontally up to 254 columns—all by means of the page-up, page-down, and arrow keys. *Word* also includes a jump-to-page command, but it works only if you've first taken the time to paginate your file.

Just as you'd expect, the backspace key erases the character to the left of the cursor; the delete key erases the character under the cursor, or, if you've highlighted a block of text, it deletes the entire block. Thanks to *Word*'s efficient automatic paragraph reforming, you can insert and delete with wild abandon without stopping to reform your text.

Many of *Word*'s commands operate on highlighted sections of text (called *selections* in Microsoft jargon). Highlighting is one of the few things you can almost always do just as efficiently with the keyboard as with the mouse. That's because *Word* conveniently assigns highlighting duties to the bottom four function keys; F7 and F8, for example, move the cursor forward and backward by word and, at the same time, expand the cursor so it highlights the entire word in inverse video. When shifted, these two keys stretch the cursor to highlight the previous and following sentence respectively. F9 and F10 highlight entire lines and paragraphs. To extend the action of one of these four keys and highlight, say, several words or sentences in succession, you hit F6 (the extend-a-feature key), then keep tapping the appropriate function key. To unhighlight a section of text, you hit the right-arrow key, shrinking the cursor back to one character and sending it to the end of the just-unhighlighted section.

Of course, you can always define a section of text with the mouse. To highlight a word,

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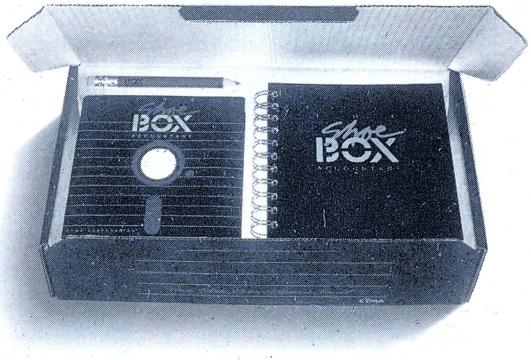

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for instance, you position the mouse pointer anywhere in that word and click the right mouse button; to highlight an entire sentence, click both buttons. Defining a line or paragraph takes a split second longer: Move the pointer into the selection bar located between the text and the left window border, point at the appropriate text, and press one of the buttons—the left button to highlight a line, the right to mark an entire paragraph.

Once you've defined a block of text, deleting it is as simple as tapping the delete key. *Word* stores your deletion in a temporary scrap pile, where it stays until you erase something else; you can see what's in the scrap (or at least an abbreviated version of it) in the status line at the bottom of the screen. To restore an accidental deletion, just tap the insert key. This is also, in fact, what you do if you want to move a block of text: You store it in the temporary scrap pile by highlighting and deleting the block, move the cursor to the new location, and press the insert key. Just make sure you don't empty the scrap by erasing something else before you do the inserting (if you do want to erase something in the meantime, you can prevent any erasing you do from going to the scrap heap by hitting shift-delete).

Copying a block is a similar procedure, except that you select the *copy* command from the main menu; this command copies the highlighted text to the scrap. You hit the insert key to put it at the new location.

Not surprisingly, such cut-and-paste operations are even easier with the mouse; you can by-pass the keyboard altogether if you'd like. To move a sentence, for example, you position the mouse pointer anywhere in the sentence, click both buttons to highlight it, move the pointer to the new location, then click the left button—that's all there is to it.

Word has a nifty system for handling pieces of text that you consistently reuse—company names, standard paragraphs, disclaimers, and the like. You can store such text in a glossary under code names such as Ad for address, Co for company name, and so forth. Then, whenever you want that text inserted verbatim at the cursor position, you type the code name followed by F3; in short order *Word* exchanges the code name for the full glossary text.

To file your glossary away so you can reuse it with other documents, you use the *glossary save* command; *Word* attaches the extension .gly to identify the file as a glossary. To activate your glossary the next time you edit, just load it into memory. Unlike most other word processors, *Word* allows you to have several glossary files in memory at the same time.

Word's *search* command will locate strings up to forty characters long. You can search forward or backward from the cursor position, have capitalization ignored or matched letter for letter, and ask that only whole words be found. Since all these options appear on a single menu, it's easy to click off the ones you want with the mouse. Using the *replace* command, you can do global replacements, either by giving *Word* carte blanche to go ahead or by taking the conservative approach and confirming each replacement yourself.

As a friendly gesture, *Word* allows you to undo your most recent editing command. Suppose you move several paragraphs from the beginning of your manuscript to the end, then decide they really belong back where they were. Simply select the *undo* command from the main menu and *Word* puts everything back the way it was. You can even undo your undo, then undo *that* undo if you want! It's got to be the ideal feature for those who can't make up their minds. The *undo* command is also indispensable for rescuing accidental deletions.

As everyone knows, *Word* does windows with a capital W. You can split the screen into as many as eight windows of almost any size or shape and then edit multiple files or look at different sections of the same file. *Word*'s windows make it especially easy to cut and paste between files or to write from notes without printing them first.

Because each window has its own set of mouse-sensitive borders, the mouse is a natural at manipulating them. To split an existing window in two, for example, you put the mouse pointer inside the double lines of that window's top or right border, depending on whether you want a vertical or horizontal split, then click the left mouse button. To change the size of a window, you move the pointer to that window's lower right-hand corner and drag the border wherever you want it.

One thing that takes some getting used to is *Word*'s practice of automatically loading the same file that's in the original window into the new one, leaving you staring at identical text in both windows. If you want to start with a clean slate in your newly opened window, you have to clear it first.

When it comes to windows, eight is adequate. For one thing, it's not easy to edit a file when your viewing area isn't much larger than a postage stamp. Even with only two windows open, you spend a lot of time scrolling, both vertically and horizontally— the latter because *Word* doesn't reduce line length to match the size of the window.

Formatting. A master of on-screen formatting, *Word* displays text just as it will be printed—provided you have a color/graphics monitor. If you have a monochrome display, you'll miss out on italics, superscripts and subscripts, strikeout, small caps, and double underlining. Although proportional spacing doesn't show up on-screen, *Word* does have a special mode that adjusts line breaks to agree with the print font you've chosen.

Although *Word* displays page breaks on-

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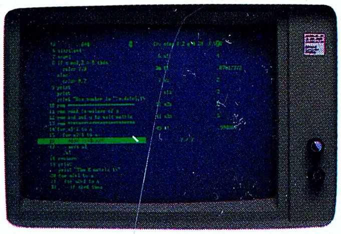

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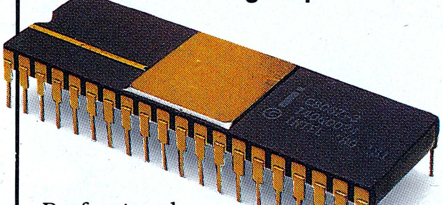

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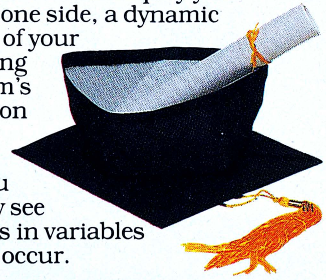

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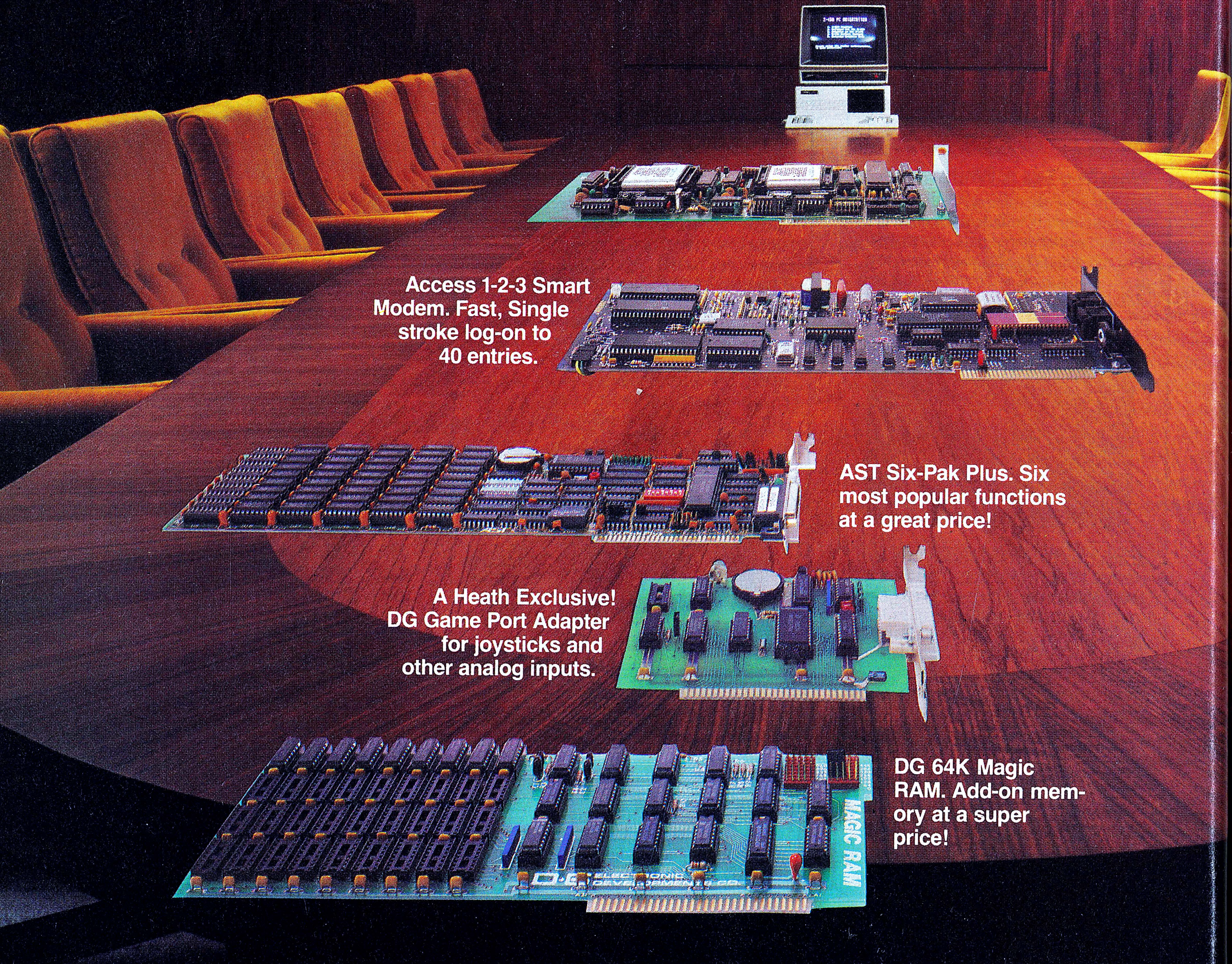

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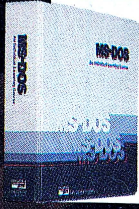

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screen, it doesn't do so until you've either printed your file once or have issued the optional *repaginate* command. If you're not particularly concerned about where page breaks fall, you can let *Word* paginate your file at print time. To its credit, the program does its best to prevent orphans and widows, those annoying short lines that inevitably split off at the top or bottom of a page.

Word doesn't control orphans and widows in paragraphs of fewer than four lines, however; to prevent such paragraphs from being split between two pages, you mark them with the *keep* command. Orphan and widow control also fails to prevent headings from being separated from the text that follows. If you're picky about such details, or if you'd just like an on-screen preview of where each break will occur, you give the *repaginate* command, a subcommand on the print menu. This causes *Word* to proceed through your file inserting markers to delineate the breaks. The previous version of *Word* was excruciatingly slow at paginating; version 1.1 is only moderately slow—a definite improvement.

Once you've printed your file, *Word* automatically displays page breaks (as well as page numbers in the status line), but only as they occurred during the last printing. Although this makes it easy to correlate what you see onscreen with your printed copy, any editing that you do has no effect on the displayed breaks. To update the page divisions on-screen, you have to repaginate.

Word gives you two ways to enter most formatting commands. You can format your text directly via several formatting menus, or you can store a group of commands in a separate file called a *style sheet*. The outcome is the same in either case; the direct method is better for simple formats, while the style sheet is the method of choice for more complex layouts.

You can have your text centered, aligned flush right, fully justified, or (best of all) printed in columns, newspaper style. To print more than one column per page, you indicate how many columns you want (you can have as many as will fit on a page) and how much space you want between them. Although you see only one column of text on-screen, at print time *Word* will pause before printing each page, rearranging it in multicolumn format.

Word makes it especially easy to set off paragraphs, such as extended quotations, by automatically indenting from the left and right margins. Similarly, you can easily create hanging paragraphs by outdenting the first line. If you prefer working with block-style paragraphs, you can have *Word* automatically insert a specified number of carriage returns before and after each paragraph and save yourself a couple of keystrokes. To set up such paragraph formats, you highlight the paragraph using the function keys or the mouse, then choose the *format paragraph* command and fill in the menu with the values you want. Or, as with most of *Word*'s formatting commands, you can avoid the menu altogether by entering a series of alt-letter combinations.

In addition to setting up regular (left-aligned) and decimal tabs, you can have your tabs right- or center-aligned. Although you can set tab stops easily enough using the keyboard, with the mouse you can literally pick them up off the ruler line and put them down where you want them. When you change a tab stop, *Word* realigns the text underneath accordingly, making rearranging tables a snap.

Word puts no length limit on headers and footers. You can easily vary both their content and position on odd- and even-numbered pages, a must for bound manuscripts. Also handy for bound manuscripts is *Word*'s allowance for a gutter width, extra spaces that are added to the left margin of odd-numbered pages and to the right margin of even-numbered pages. For page numbers, in addition to the usual Arabic numbers, you have a choice of Roman or alphabetic characters in either upper or lower case.

Word handles footnotes with ease. It prints them at the bottom of the page that contains the referring text (in which case they're separated from the main text by a dashed line), or it dumps footnotes en masse at the end of your document. Although *Word* stores all your footnotes at the end of the file, you can create a special footnote window where you can view them without having to jump back and forth. As you scroll through your document, the footnote window scrolls simultaneously to show you any footnotes referenced in the text window.

Although *Word* doesn't provide hyphen help, it does allow you to insert discretionary hyphens that print only if that word falls at the end of a line. You can also insert nonbreaking hyphens that keep hyphenated names from being split between two lines.

If you plan to take advantage of *Word*'s sophisticated formatting features, it's well worth your time to set up your own style sheets. A style sheet is a file in which you store a set of commands to format a particular kind of document. Once you link a style sheet with one of your documents, that style sheet will automatically load into memory each time you edit the file. Style sheets do more than just change the default values for margin settings, line spacing, and the like; they also allow you to enter several formatting commands with a single keystroke. For example, one entry in your style sheet might be a series of commands to set off extended quotations by spacing down two lines, indenting one inch from the left and right margins, changing to compressed print, and, finally, spacing down another line at the end of the paragraph. If you assign this series of com-

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mands a code of, say, Q1, whenever you type an extended quote, you can have it automatically formatted simply by highlighting it and then typing *Q1*.

Another advantage of using style sheets is that you can print the same document under several formats. If you were writing a newsletter, for example, you might want to print intermediate drafts in single-column, double-spaced format and the final version newspaper style, single-spaced in multiple columns. By loading different style sheets, you can print the same piece in either style without having to insert formatting codes.

It's too bad that Microsoft has made the process of creating style sheets so difficult. You're forced to define your commands in terms of Microsoft jargon, mysterious words like *usage* and *variant*. To make things worse, the manual does little to help you translate Microsoft's newspeak.

Printing. *Word* is just as professional about printing as it is about formatting, supporting sixty-four fonts, including the proportional spacing fonts of most popular printers. If you have a daisy-wheel printer and you want to change fonts in the middle of your document, *Word* automatically stops during the printout and prompts you to change print wheels.

Word offers more than the usual number of print-time conveniences. If you have two printers, both a dot-matrix and a letter-quality, for example, you can print to either of them. So that you don't have to name your printer each time you print, *Word* remembers which one you used during the last printing session. Other options allow you to use your printer as a typewriter, print multiple copies, print in the background while you edit, and use a dual-bin feeder.

Word is also set up to communicate with phototypesetters and laser printers. By printing to an intermediate file called a printer control file, *Word* can relay the information necessary to produce page images, including the precise position of every character to one one-thousandth of an inch.

You pay a small price, however, for such sophistication. Since typesetters don't normally measure in terms of lines and columns, neither does *Word* (that's why no line or column numbers appear in the status line). Therefore, you have to change your way of thinking about margins, tab stops, page length, and so on. You can express these settings in a variety of units: inches, centimeters, pitch, or points—but never columns or lines. For those of us used to thinking in terms of a sixty-five-column line with tabs set every five columns, *Word*'s exotic units take a little getting used to.

File Handling. Most of *Word*'s file operations begin with the main menu's *transfer* command. After choosing *transfer*, you're offered a list of subcommands, including *load, save, delete, merge*, and *clear memory*. *Word* then prompts you to enter a filename; if you need to see the file directory, you press one of the arrow keys or click the right mouse button.

Although *Word* takes its time writing your work to disk when you do a save, as a safety measure it makes a backup copy of the unchanged version of your file and then conscientiously returns you to the editing screen with the cursor positioned exactly where you left it. Another convenience, this one new with version 1.1, gives you an update on the number of characters in your file each time you save.

If you attempt to quit the program without having saved your work, *Word* highlights your text (a real attention-grabber) and lets you take care of the save with a single click of the mouse. Unlike the previous edition, version 1.1 is smart enough to know whether or not you have any unsaved edits; if you don't, it lets you exit, no questions asked.

Word places no limits on file size other than the amount of space you have available on disk. Unlike many other programs that perform automatic disk buffering, *Word* writes temporary files to the program disk as you edit. Then, when you give the *save* command, it transfers those temporary files to your data disk. If you tend to do a lot of editing between saves, it's possible that the temporary files will eventually eat up all the disk space. In that event, *Word* will display a "Disk Full" message, which is your cue to do an immediate save, after which you can continue editing.

Brand-new to this version of *Word* is a built-in merge feature that you can use to grind out form letters or chain several files together to be printed as one long document. You can insert data into form letters directly from the keyboard at print time or from a data file—either a file that you've created with *Word* or the ASCII output of a database.

Each record can have a generous 256 fields, which you delimit with either commas or tabs; there are no restrictions on field length. At the beginning of your data file, you place a header that lists field names (variables) in the same order they appear in each record.

You create your form letter just as you would any other *Word* file, except that you include instructions for which data file is to be merged and, of course, which variables you want inserted from that data file. *Word* recognizes as instructions anything that's inside brackets. To indicate which data file is to be merged, for example, you simply type the file's name inside brackets at the top of your form letter. Next, you type the letter itself, inserting variable names in all the appropriate spots. If you want different text printed for different

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records, you can use conditional commands such as this one:

> **⟨⟨IF donation ⟩ 10⟩⟩ We can't thank you enough for your generosity. ⟨⟨ELSE⟩⟩ We appreciate your support. ⟨⟨ENDIF⟩⟩**

Such commands tell *Word* to print one thing if the condition is true, something else if it's false.

For data you want to enter from the keyboard at print time, you can choose between two commands. The *set* command prompts you only once and prints the same information (the date, for example) in each copy of your letter. The *ask* command prompts you for new data for each copy of the letter. If you have only a few form letters to send, rather than fooling with a data file, you might set up a series of *ask* commands that prompt you for name, address, and so forth. With both commands, unless you make special arrangements, you'll be prompted with "Enter Text", which isn't all that helpful. Fortunately, you can write the script for the prompts yourself, as with:

> **⟨⟨SET date=? What's today's date⟩⟩.**

Besides form letters, the merge feature helps out with document assembly. Using the *include* command followed by a filename, you can insert boilerplate paragraphs—or even the ASCII output from another program—into your manuscripts. Another use of the *include* command is to chain several files (book chapters, for example) into one long manuscript. You can also nest *include* commands so that one included file calls another.

Spelling Help. Those of you who think a word processor incomplete without a spelling checker will be happy to know that two software publishers have adapted their spellers to run with *Word*. You can choose between Oasis Systems's *The Word Plus* and Wang Electronic Publishing's *Random House Proofreader*. We'll take a look at both in upcoming columns.

Documentation and Support. *Word*'s 400-page manual is divided into four tabbed sections: a short tutorial, an overview that offers some strategies for using the program, a reference section outlining each command, and appendixes that include a glossary plus detailed information about printing and using the merge feature. Although the manual tells you everything you need to know about the program (maybe even more than you'd care to know), it's full of jargon—not the usual word processing jargon, mind you, but Microsoft's own. (It never mentions the cursor, for example, but instead talks about "selecting" text.) As a result, something as simple as indenting your margin half an inch becomes needlessly complex. And because reference material is spread out over several sections, you often end up looking in five different places for information about a single command. The manual's saving graces are its illustrations and screens.

If you purchase *Word* with the mouse, you get a manual that describes its care and feeding as well as how to integrate it into other application programs. With the help of step-by-step instructions, you can install the mouse's interface card yourself in less than two minutes—even if you've never installed anything more complicated than key stickers.

Word comes with a copy-protected program disk and backup copy, plus a utility disk; the utility disk contains printer drivers and a conversion program for *WordStar* files. Mouse users, of course, get a mouse disk, which now includes Microsoft's *Mouse Menus*, a program that gives you pop-up menus for Lotus *1-2-3*, *Multiplan*, *VisiCalc*, and (wonders will never cease) *WordStar*.

Microsoft runs a hot line that's an excellent source of information. However, depending on the time of day you call, be prepared to hold the line.

Ease of Learning and Use. At least where its basic features are concerned, *Word* is easy to learn. Its menus are self-explanatory, its prompts clear. In addition, there's an on-line help feature that gives you information keyed to the command you're using. *Word* isn't, however, as simple a program as it appears on the surface. Just deciding which of its features you want to use is bewildering. And taking advantage of the advanced formatting features, especially the style sheets, requires a little extra time and patience.

Thanks to the mouse, *Word* gives you all the advantages of a menu-driven program without making you pay with extra keystrokes. Although moving the mouse pointer is a little awkward at first, with practice you'll have the mouse scurrying over your desk, wiping out typos and taking aim at commands.

Summary. *Word* is an ideal choice for anyone working with demanding formats—someone, for example, who writes a newsletter and then feeds it to a typesetter. Because of the mouse's editing efficiency, *Word* is also a sure bet for anyone who goes through several rewrites of each document.

System Requirements. *Word* requires one disk drive and 128K; it can take advantage of additional memory up to 256K. With version 1.1, *Word*'s list of supported printers (especially the dot-matrix variety) has grown considerably, and Microsoft reports that more are on the way.

Word runs on the PC*jr*. ▲

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Terry Tinsley Datz and F. Lloyd Datz are the authors of Processing Words with Your IBM PC, PC XT, or PC Compatible, *recently published by Hayden Book Company.*

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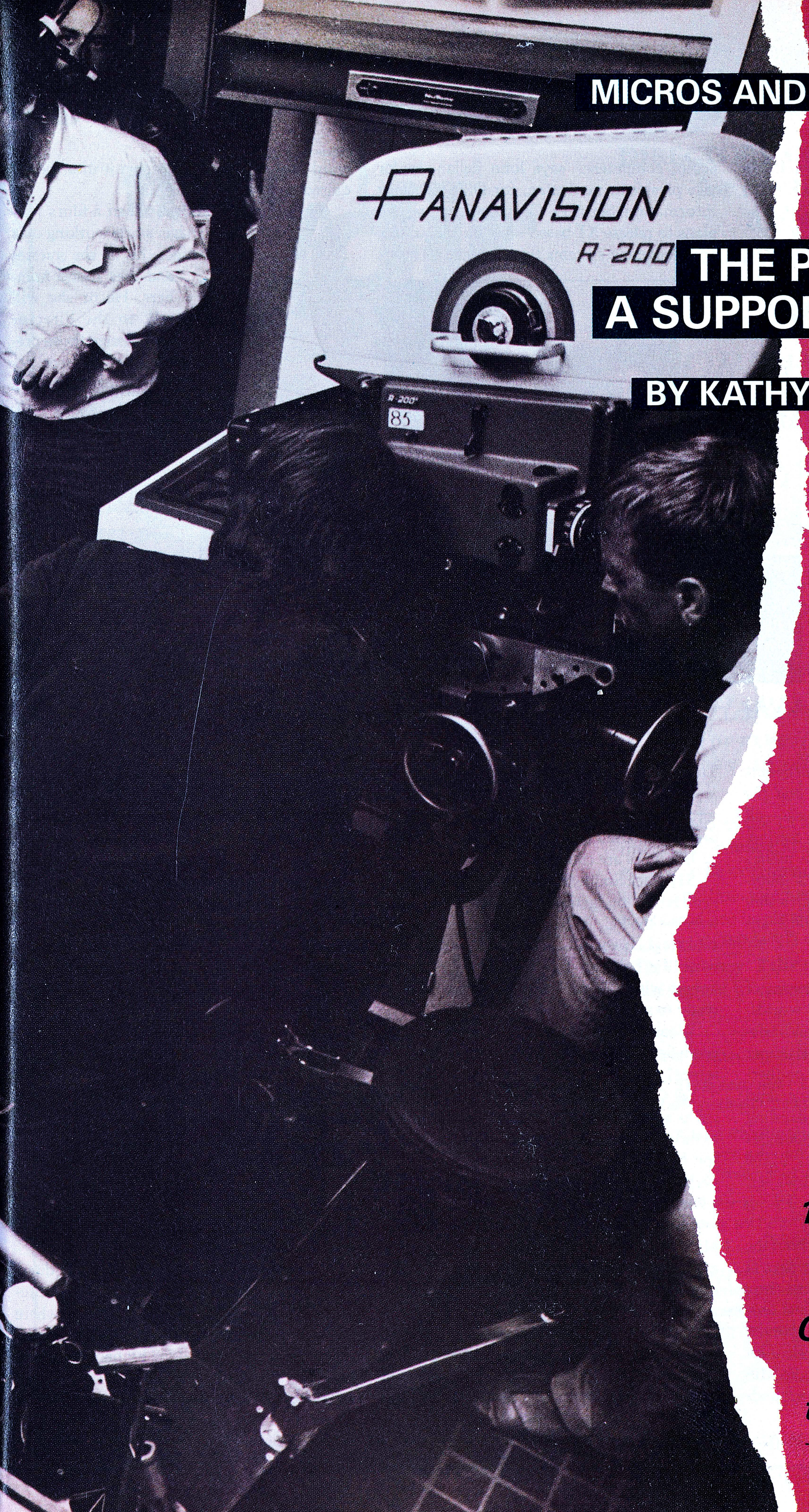


MICROS AND MOVIEMAKING

THE PC VIES FOR A SUPPORTING ROLE

BY KATHY TALLEY-JONES

*Scene: An imaginary writers' den on La Cienega Boulevard, West Hollywood, California. Harry and Mary Nyman (*Homage to Estonia, Starbait*) struggle with a movie script they're writing—"Green Flash," the story of the life, loves, and death of a member of the 1954 Alfa Romeo racing team—on their battered Compaq portable. They've finished the script and are*

Photography by: Quantum Films

now formatting it with a script-formatting program.

Cut to: The Imaginary Independent Production Company, Burbank, California

Imaginary Independent VP George Subotnik has been shown the "Green Flash" script by the Nymans' agent, Thomson and Ferris; he loves it. All concerned take a few lunches; a deal is made. Subotnik hires Jessy Bolcomb as assistant director.

Cut to: Imaginary Independent's production manager's office

Bolcomb begins scanning the script for a preliminary budget, running a script-breakdown program on Imaginary Independent's XT. After determining roughly what the production's needs will be, she runs her figures through a budgeting program and comes up with an estimated final cost of something around $5 million. If the picture is actually made (there's a fair chance it won't be—many films are budgeted, but few are made), it's likely the budget will change daily.

Cut to: On location in Milano, Italy

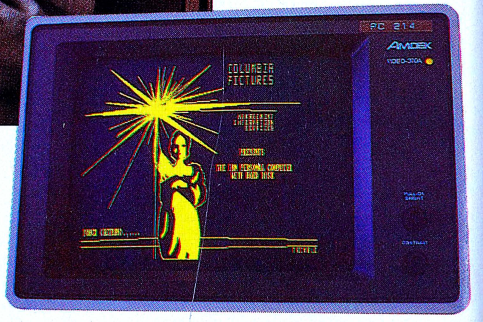
Harry Nancarrow, the location accountant, monitors expenses, the payroll, and the status of the budget on a day-to-day basis—all in lire, all on the company's PC. Every Sunday he hooks up his PC and phones the week's numbers to Imaginary Independent's mainframe in Burbank. The picture is half a day ahead of schedule and things are going—almost—as planned.

Cut to: Reality

Movies have brought us visions of future worlds and other worlds, complete with phasers and teletransporters. Movies have been made *about* micros (notably the micro as agent of thermonuclear destruction in *WarGames*), and movies have been enhanced with dazzling computer-generated special effects (Douglas Trumbull's *Brainstorm* is one example). In the everyday work of filmmaking, however, there's been some resistance to the idea of *using* small computers.

Some of the resistance to micros within the movie industry results from the frantic pace at which movie people work at putting their shows together—these people don't have time to learn to use the latest technological wonder that will make some of their dog work a lot easier. Says the manager of a major studio MIS department, "We don't want to be groundbreakers because of our deadlines."

"It has taken Hollywood twenty years to accept computers," says John Bellah, senior vice president, marketing, for DISC (Draney Information Services Corporation), which plans to release XT-based location accounting and budgeting systems this summer. "There's been an inherent fear of computers all along."



William Hausch, Columbia Pictures's manager, MIS production systems, is looking for a few good PCs—and pieces of software.
The Columbia logo digitized for Columbia's in-house system by Tim Trimble.

But times are changing.

Says Jack Smith of DotZero, a developer of production budgeting and accounting software for the PC, "When I first got into this two years ago, people said, 'God, a computer, what the hell can that do?' Now everyone knows what the computer does, and they're ready to start doing something with it."

What are some of the everyday chores a PC can help with in taking a movie from script to screen?

Let's start with the script. Most movies begin as a script of one kind or another, although as those who have seen Francois Truffaut's *Day for Night* can attest, scriptwriting can be a very fluid process. This is an aspect of the job where the PC proves invaluable—in coping with the frequent, nay, daily, changes that take place as a movie is produced. Nothing can beat a word processor for effecting script changes quickly and easily.

But scriptwriting can require more than a copy of *WordStar*. Screenplays have a special format, and aspiring screenwriters know that their work should not deviate from the standard if it's to entice agents or producers. Text formatters such as *Scriptor* (Screenplay Systems, Burbank, CA) take a file generated by a word processor and transform it into the required multi-indented format.

As for the budget, when a film's production manager starts working on a picture's budget, he or she guesses and uses round numbers. He or she will talk to the director and change those preliminary guesses accordingly. Budgeting software, now available for the PC, can make these changes a snap and help track a picture's byzantine budget through the myriad changes that occur daily.

Information concerning production needs is passed along to casting directors, costumers, and the special effects crew, among others. The assistant director equipped with a microcomputer and budgeting software can keep track of all of these departments' expenditures on detailed subaccounts within the budget; changes in particular subaccounts will be reflected on the top sheet, which keeps track of the estimated final budget for the entire picture.

Once the decision to produce a picture has been made, the production manager takes the script and breaks it down to determine what props, sets, and actors are needed. Until recently this work was generally done by hand, but now that script-breakdown software has become available for the PC, a production manager can fill in the relevant information for each scene on a template produced by means of the program.

As the movie is being shot, the assistant director needs to keep track of locations, interior and exterior sets, the cast, when and where each actor is needed, and extras. Traditionally, much of this has been done by hand in accordionlike "story boards" filled with color-coded strips containing information for each scene. The story board is a flexible and time-honored tool; talk of replacing these boards with infor-

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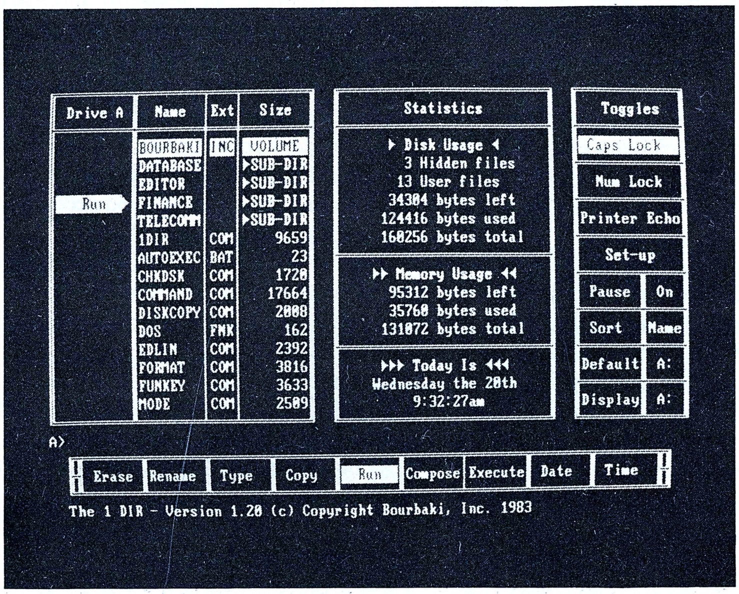

```
 Drive A   Name     Ext  Size         Statistics              Toggles
          BOURBAKI  INC  VOLUME      ▶ Disk Usage ◀          Caps Lock
          DATABASE      ▶SUB-DIR      3 Hidden files          Num Lock
          EDITOR        ▶SUB-DIR     13 User files          Printer Echo
  Run  ▶  FINANCE       ▶SUB-DIR     34304 bytes left          Set-up
          TELECOMM      ▶SUB-DIR     124416 bytes used       Pause    On
          1DIR      COM     9659     160256 bytes total      Sort    Name
          AUTOEXEC  BAT       23                             Default  A:
          CHKDSK    COM     1720     ▶▶ Memory Usage ◀◀      Display  A:
          COMMAND   COM    17664     95312 bytes left
          DISKCOPY  COM     2008     35760 bytes used
          DOS       FNK      162     131072 bytes total
          EDLIN     COM     2392
          FORMAT    COM     3816     ▶▶▶ Today Is ◀◀◀
          FUNKEY    COM     3633     Wednesday the 20th
          MODE      COM     2509     9:32:27am
A>
  Erase  Rename  Type  Copy  Run  Compose  Execute  Date  Time
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mation on a PC's screen meets considerable resistance. Nevertheless, the information pasted onto the colored strips can be generated from a script-breakdown program.

"Information still comes from production managers," says one assistant director, "and computers won't make them obsolete."

As any moviegoer knows, a film's opening credits feature the main logo of the studio—the snarling MGM lion, the Warner Bros. shield, Columbia holding her torch. Following the studio logo, you'll often see something like "An Independent Imaginary Production." This means that a studio has bankrolled the movie but an independent production company has produced it. Or, perhaps, the production company has produced the movie on its own, and the major studio is distributing it.

A major studio will often have its own location accountant or auditor working with the production company. This person keeps in close contact with the director and the assistant director on a movie project and has a good idea whether the shooting is behind or ahead of schedule.

Let's suppose a major studio has bankrolled our imaginary movie *Green Flash*, which is being produced by Imaginary Independent Productions. The studio has sent Harry Nancarrow to be location auditor, and Nancarrow is keeping track of expenses on the set in Milano.

It stands to reason that, to make a satisfying car-racing movie, the crew must crash at least one Alfa Romeo. If they crash the car and discover later that the key grip's Camaro (a painfully obvious anachronism) is visible in the background, they'll need to reshoot and destroy another car (to say nothing of hiring a new key grip)—all of which will throw the production behind and cause far-reaching budgetary shockwaves. A few extra days of production will occasion extra costs for labor, union members' per diem, another car, and so on. If the studio's location accountant is outfitted with a PC, however, he'll have no trouble keeping current on the costs and keeping the studio informed of estimated final costs.

These production figures can then be uploaded to a master production cost program on a studio mainframe; the mainframe program will keep track of all the production information on all the movies the studio might be making.

The assistant directors and production managers who've been using PCs in filmmaking are the ones to whom the price difference between a PC and a mainframe behemoth matters. Independent productions that don't have a big studio's corporate data processing center to fall back on for budgeting and location accounting have been the ones buying or renting PCs. These location accountants and production managers are realizing that the microcomputer can make all the difference in organizing their budgeting, shooting schedules, and accounting.

Many of these production people have never before used a computer. They are now finding that they can afford to automate because the price of computing has come within their grasp.

David Hamburger is one independent production manager and assistant director unafraid of computers. He and a friend once built a computer out of pinball machine parts; now, twenty years later, he's just acquired an XT to help with his budgeting work.

Hamburger first worked with a Kaypro—the computer of choice among independent movie people because it's cheap and comes bundled with everything a person needs to start computing—and he looked around for packages that could help with his complex logistical and budgeting needs. Would a spreadsheet be what he needed? A word processor? A database manager? He tried writing script breakdown and budgeting programs in *dBase II* and was thus engaged when he discovered *DataMogul*, a budgeting package developed by Emil Safier for his Quantum Films Software.

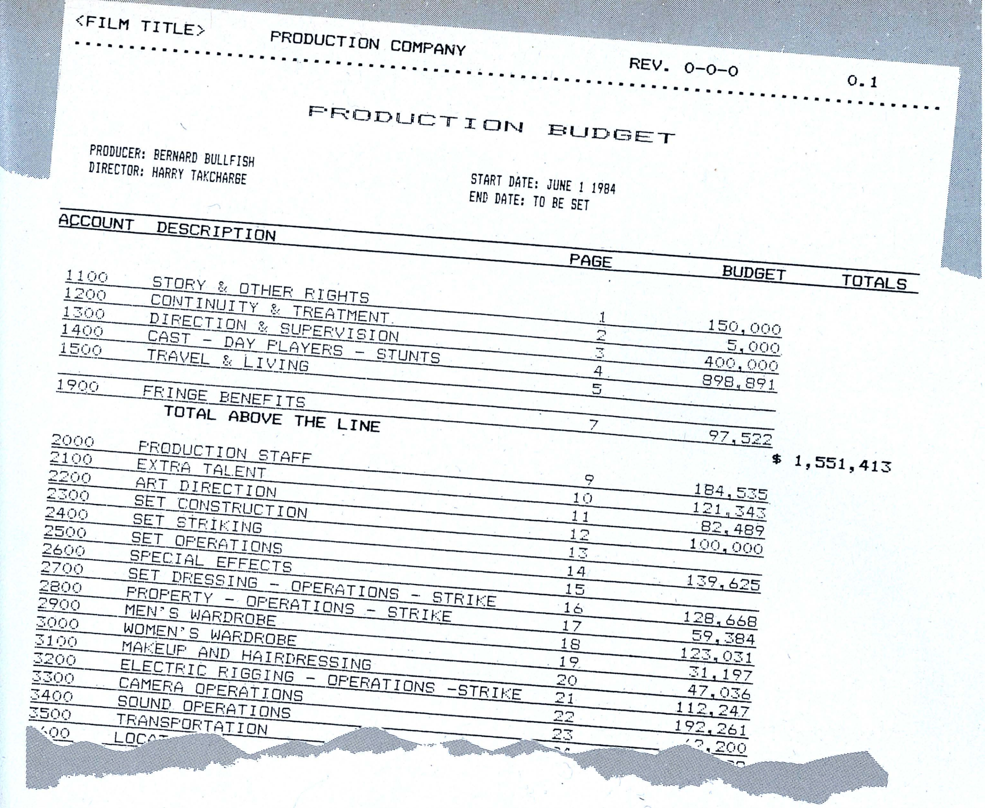
Hamburger likes *DataMogul*'s flexibility and the fact that he can use it to create budget templates suitable for use on other movie projects. If, for example, he hires the same cameraman for two pictures, he doesn't have to reinput that part of the budget, saving considerable time in the budgeting process.

What can a budgeting program like *DataMogul* do for a movie production that a spreadsheet or a database manager cannot? "Why use a pick when you can use a jackhammer?" replies Hamburger.

"An independent production will *need* to use computers," says Hamburger. "Anyone who doesn't is living in the past."

Columbia Pictures is one major studio that's looking for a portable, flexible microcomputer system. They've used the IBM 5285 for several years; it was, in fact, the system used on the New York and The Burbank Studios production of their summer hit, *Ghostbusters.*

But, says William Hausch, manager of MIS production systems, the 5285 "is a big clunker of a machine that doesn't look state-of-the-art at all. Still, IBM tells me it's fairly sophisticated and very reliable. We asked IBM if the 5285



```
<FILM TITLE>          PRODUCTION COMPANY
.............................................   REV. 0-0-0        0.1
                     PRODUCTION BUDGET
PRODUCER: BERNARD BULLFISH
DIRECTOR: HARRY TAKCHARGE             START DATE: JUNE 1 1984
                                      END DATE: TO BE SET
ACCOUNT  DESCRIPTION
                                            PAGE      BUDGET       TOTALS
1100     STORY & OTHER RIGHTS
1200     CONTINUITY & TREATMENT               1
1300     DIRECTION & SUPERVISION              2      150,000
1400     CAST - DAY PLAYERS - STUNTS          3        5,000
1500     TRAVEL & LIVING                      4      400,000
                                              5      898,891
1900     FRINGE BENEFITS
            TOTAL ABOVE THE LINE              7
                                                      97,522
2000     PRODUCTION STAFF                                      $ 1,551,413
2100     EXTRA TALENT
2200     ART DIRECTION                        9
2300     SET CONSTRUCTION                    10      184,535
2400     SET STRIKING                        11      121,343
2500     SET OPERATIONS                      12       82,489
2600     SPECIAL EFFECTS                     13      100,000
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                                                       2,200
```

A sample movie production top sheet from Emil Safier's DataMogul.

technology would continue to be supported along with the XT's, and IBM said, 'We support all our technology.' We decided to make the break and move toward a more state-of-the-art, portable computer."

For Columbia, one of the primary requirements of a location system is, of course, portability; a production company might be working across the street at The Burbank Studios or across the world in Morocco.

Columbia also wants its microcomputer system to be independent of the mainframe, so that the studio will be covered if the mainframe goes down. They also want a standalone system, as opposed to a large multiuser system with remote terminals, because their production companies are generally independent of the studio (the location accountant, however, comes from Columbia and works closely with the production company).

Another reason Columbia's micro system must be independent is that many of their production companies' accounts payable functions are handled by the production company on location; invoices that come in have to be paid forthwith, rather than being routed through the studio. A production on location has to have check-writing capability and has to deal with a lot of petty cash; they're building sets and need to buy incidental bits and pieces locally. They also have to pay per diems in cash to union people.

A movie production company spends, on average, $10 to $12 million on a picture—something like $150,000 a day. Naturally, Columbia is very concerned with monitoring such costs. "A production is a runaway freight train," says Hausch. "You have to stay on top of it all the time."

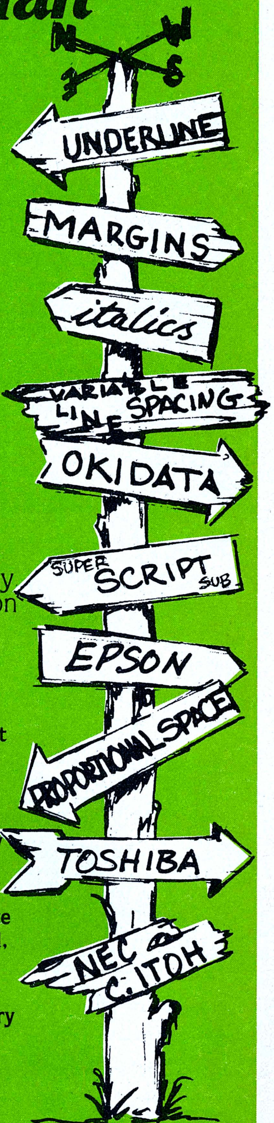
Columbia's location accountants also work on the production company's payroll; they're not actually cutting the checks (that's generally handled by the studio), but they input time cards for people who are hired locally or come in from Hollywood. Costs such as these have to be reflected right away. The payroll changes daily; some people work for only half a day or a day and a half.

"It's never plain vanilla," says Hausch. A production has several unions involved, each with unique retirement payments, special rules, salary changes, meal penalties, and so on.

Columbia's 5285 is dedicated to the current on-line terminal system that Columbia uses on location. But the studio has discovered that the 5285's accounting software is neither sophisticated enough nor particularly easy for location accountants to use. Properly designed software on the XT, Hausch says, would be more flexible and would run more than the location-accounting application.

Accustomed to shipping the larger 5285 around, Columbia is considering an XT over a portable PC-compatible equipped with a hard disk. "There's some concern that the portable's screen is too small," said Hausch, "but we haven't had any complaints yet because no one's seen it. Production people are artistes—if they don't like something, they don't like it." No complaints have been voiced about the software Columbia has looked at to run on the XT, but there have been some about the printer's letter size.

"If a senior V.P. complains he can't read it, it stops right there," says Hausch.



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Ghost in the Machine. Columbia Pictures used IBM's 5285 on its high-tech production Ghostbusters. *They're now switching to the XT.*

IBM PC PACKAGES USED IN THE MOVIE INDUSTRY

Board of Directors (automated production boards system)—Adam R. Felde, 377 Skyeway Road, Los Angeles, CA 90049 (213-472-3082).

DataMogul (script breakdown, budgeting, location accounting)—Quantum Films Software, 8344 Melrose Avenue, Suite 24, Los Angeles, CA 90069 (213-852-9661).

DISC, Payroll, Location Accounting, Budgeting—DISC, 3400 West Alameda Avenue, Burbank, CA 91505 (818-841-9777).

DotZero Budgeting, Production Scheduling—DotZero, 8425 West Third Street, Suite 300, Los Angeles, CA 90048 (213-655-4005).

PM Budgeting (production management software for film and television)—Screen Systems, 211 East Olive Avenue, Suite 208, Burbank, CA 91502.

Scriptor (sceenplay text formatter)—Screenplay Systems, 211 East Olive Avenue, Suite 208, Burbank, CA 91502 (818-843-6557).

Columbia also needs to come up with a micro-to-mainframe communications link. They have to be able to take what the location auditor feeds into the on-site micro each day and send that to the studio's mainframe accounts payable or payroll system, which feeds the production cost system on the mainframe.

The mainframe's production cost system keeps a master record of all pictures, not just the one on which the micro may be reporting. Also, if a production is on location and is scheduled to work back home at The Burbank Studios in two weeks, a link from mainframe back to micro is needed so that the assistant director and production manager will know what's going on back in California. They'd like to link up daily; the 5285 currently receives such a report once or twice a week.

At the moment Columbia uses the Warner Bros. data center. In response to a slump in the entertainment business, Columbia and Warner Bros. created The Burbank Studios (on the old Warner Bros. lot) in 1972. Columbia designed the computer systems that were used, but the applications ran on Warner Bros.'s computers, which meant that all of Columbia's data passed through the Warner Bros. system.

But when Coca-Cola took over Columbia, it was not thrilled with the cost of running its data through Warner Bros., and it didn't like the idea of competitors' storing and processing Columbia's data. Columbia has been taking everything off the Warner Bros. computers, building a data processing presence in Hollywood to help do this and to get the information onto Columbia's IBM mainframes in New York.

The computer situation is in a state of flux at Columbia, and it may be the end of the year before the micros are on location and reporting daily to their big brothers back east. Until then, Hausch will be exploring other potential applications for micros in film production for Columbia.

"Location accounting is something that has been done on mainframes for years," says Hausch. "But as far as being innovative in helping with production, I don't think we know what to do yet with PCs."

Cut to: Variety, *September 1984*

Green Flash *brought in $500,000 under budget, two days early, reports Imaginary Independent honcho George Subotnik.*

Cut to: The Reviews

"Deeply illuminating"—Andrew Sarris, Village Voice

"Blazing, tender, and terrifying"—Sheila Benson, Los Angeles Times

"Great car crashes!"—Roger Ebert, At the Movies ▲

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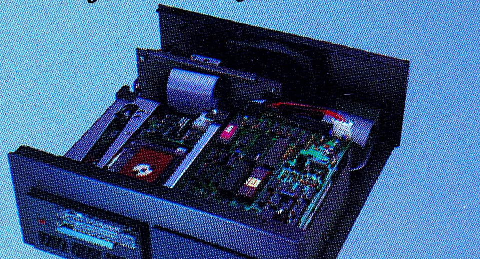

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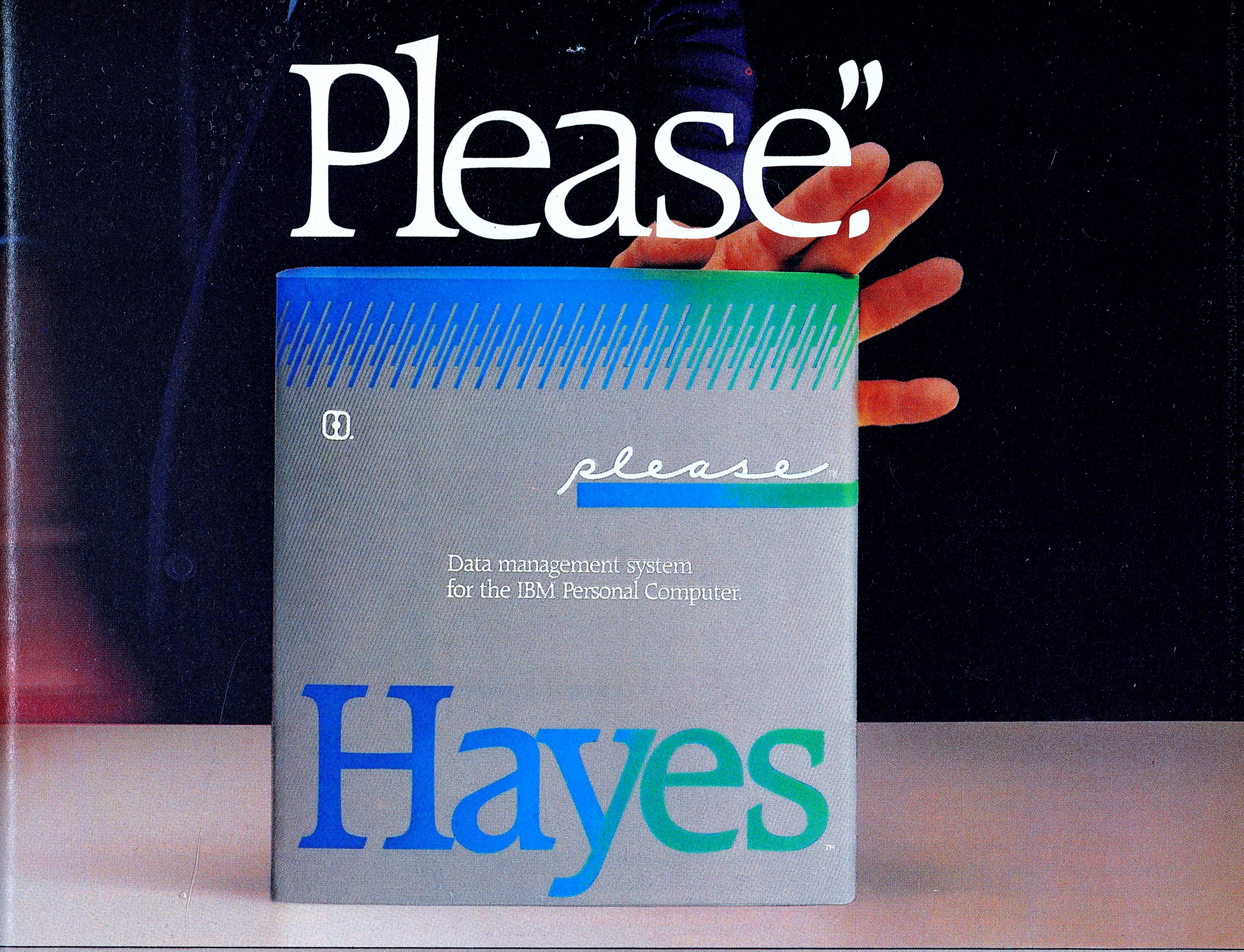

"Put it here, Please."
Design a special screen format to position data in a particular place.

knowing all that storage power is there? Just in case you ever need it?

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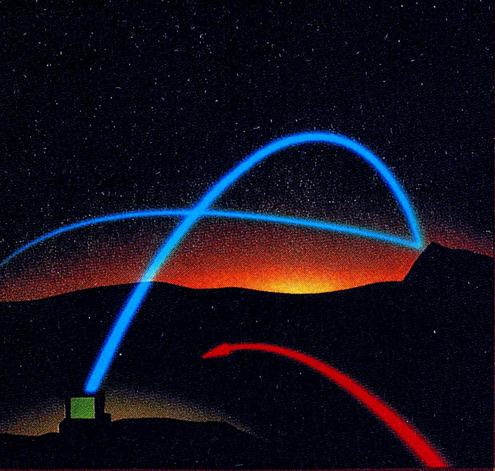

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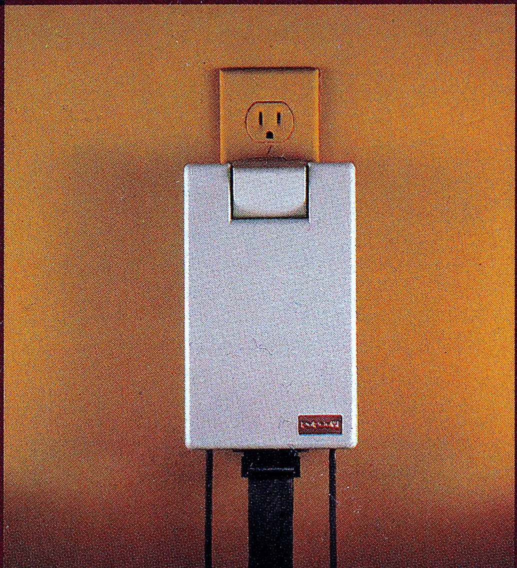

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CAUTION: MAKE SURE THE POWER IS OFF BEFORE OPENING THE CASE.

6. Set the eight binary switches (consult your manual for details).
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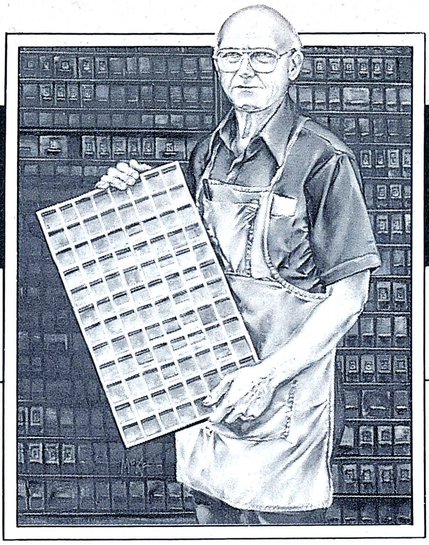

The Printed Word

by John Dickinson

1-2-3's Printer Driver

Lotus Development Corporation's *1-2-3* is a bestseller because it does so many things so well; one of those things it does so well is print spreadsheet reports. *1-2-3*'s printer driver is table-driven, accessible, and easy to use. The driver can be configured to use the intelligent features of any PC-compatible printer and is flexible enough to allow a variety of report formats.

But that's only the good news about printing with *1-2-3*. The *great* news is the PrintGraph program that comes with *1-2-3*. PrintGraph can use any of several popular models of pen plotter and matrix printer with dot-addressable graphics capabilities to reproduce *1-2-3*'s business graphics; any graphic that appears on-screen can be printed. For PC users who prefer IBM's monochrome screen, the best news of all is that, even if you don't have a graphics adapter and monitor, you can still use PrintGraph to print graphs. More about PrintGraph presently.

Spreadsheet Reports. The printer driver *1-2-3* uses for spreadsheet printouts follows a standard generally employed by number-oriented report generators. You set printer options once before you start printing, and the settings remain in effect until the printout is complete. This standard usually makes sense; it's difficult to imagine many situations where you'd want compressed characters mixed in with standard or wide characters in a table of numbers. If you do need to mix things up, however, read on; Lotus provides an easy way to do this, too.

Two sets of printer parameters, called from different places in *1-2-3*, affect report formats and printer control.

One set presents global options through which you tell the program what kind of printer you have and how it interfaces to your computer. You access these options through the command sequence */WGDP* (worksheet, global, default, printer); the options include:

- Interface—specifies which parallel or serial port your printer is attached to.
- Auto-LF—tells *1-2-3* whether your printer does line feeds with each carriage return.
- Left—sets left margin in character columns.
- Right—sets right margin in character columns.
- Top—sets top margin in print lines.
- Bottom—sets bottom margin in print lines.
- Page—sets page length in print lines.
- Wait—tells *1-2-3* whether you want it to wait after printing each page to allow manual paper insertion.
- Setup—allows you to specify a default printer setup command sequence.

Most of the printer parameters set by *1-2-3* follow the enhanced standard printer method (see the June installment of this column for a description of this method). The exception is the setup parameter, which allows you to input any ASCII command sequence that sets options for your printer. Whatever default setup string you specify here will be sent to your printer whenever *1-2-3* starts printing a report, and any enabled options will remain in effect for the duration of the report.

ASCII characters or decimal ASCII sequence numbers can be used for the setup option's command sequence; ASCII sequence numbers are required for any command sequence characters that lie outside the printable range. Since most printer command sequences require the escape character (ASCII 027), you may prefer using sequence numbers for all characters in a command sequence. You can mix the formats, but it's easier to read a command sequence that's in just one format.

The ASCII sequence number format requires that each three-digit number be preceded by a backslash (\ ). Most people use *1-2-3*'s setup command sequence to set their printers for compressed printing in order to fit wide spreadsheets on standard 8 1/2-by-11-inch paper. To set the Epson MX-80 to print *1-2-3* spreadsheets in compressed print by default, you'd type */WGDP* (or make the equivalent menu choices), and in response to the prompt

Enter Setup String:

you'd enter *\015*. "Enter setup string" is the prompt that *1-2-3* displays on the command panel at the top of the screen; following this prompt you'll see any setup sequence you may have entered previously.

Let's say, for example, that you've been printing reports in the condensed font, and you decide that they would look even neater in double-strike mode. To add double-strike to your global default printer setup string, you'd type */WGDP*, in response to which *1-2-3* would display

Enter Setup String: \015

Then you would tack on *\027\071* to make the entire setup string read \015\027\071.

The *Print* Command. Many of the printer options, as well as other *1-2-3* report options, may be accessed by means of the *print* command. Options that you can set via *print* include:

- Header—report header for each page.
- Footer—report footer for each page.
- Margins—top, bottom, left, and right margins (as above).
- Borders—columns and rows to use for report labels (label field not required).
- Setup—printer command sequence (as above).
- Page length—printed page length (as above).

As you can see, several options are accessible either via *print* or via the global default sequence outlined previously. The */WGDP* command lets you set options globally, while *print* lets you override these defaults locally. You'll find the *print* command handy when you want to experiment with new ways of outputting your reports or for differentiating between drafts and final versions.

1-2-3 saves both sets of printer options with your spreadsheet. The fact that options can be changed quickly makes it easy to print reports in a variety of styles or formats.

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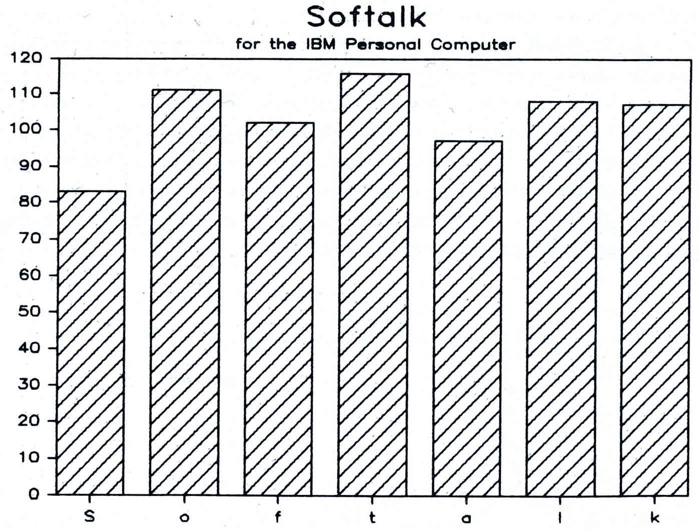

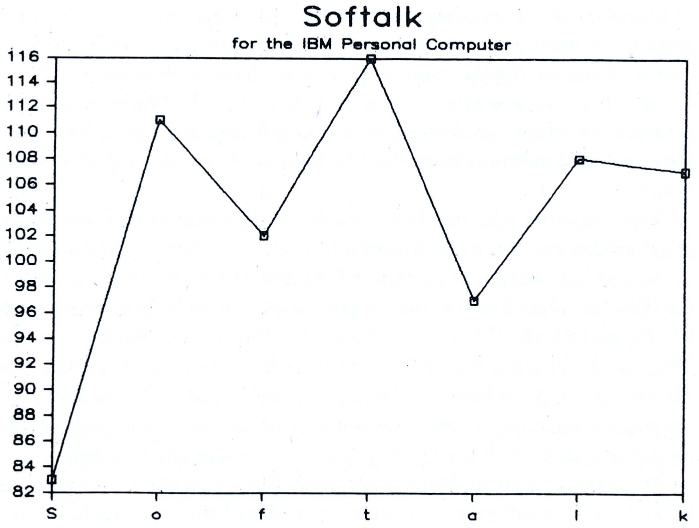

If a single setup string at the top of your report isn't sufficient for your needs, you can avail yourself of Lotus's print-to-file routine. This will store your spreadsheet in a file, allowing you to format it further from within some other program. The material in a file so created will look identical to a hard-copy printout, except that any setup command sequence you may have specified will not appear.

Most people prefer to use their favorite word processor to add such features as underlining or boldface to selected portions of the spreadsheet, but, of course, such enhancement can be done by way of any software that can read an ASCII file. Lotus's *Symphony*, probably available by the time you read this, has its own word processor, which should serve to enhance spreadsheet printouts, but *Symphony* will have a print-to-file option as well.

PrintGraph. Anyone who has tinkered with printer graphics knows how much work is involved. Even the simplest tiny picture can require an overwhelming amount of data (not to mention a good deal of patience). Debugging a printer graphics program is a slow process and can easily drive one to distraction.

Lotus's PrintGraph program is a balm to those who have tried printer graphics on their own and may, by itself, be worth the price of *1-2-3*. PrintGraph is driven by the data and options supplied by *1-2-3*'s screen graphics and will produce any graph you specify on your plotter or graphics-capable printer.

All you have to do to use PrintGraph is specify which graphs you want to use with *1-2-3*'s graph facility and save these graphs for subsequent printing via PrintGraph; this process—saving graphs for PrintGraph—is accomplished via a different option than is the naming of graphs for storage with your worksheet.

Graph types supported by *1-2-3* include line, bar, x-y, stacked-bar, and pie chart. You may specify any spreadsheet range for a graph's axes, and you may enable various options for each type of graph. These options permit you to specify the graph's legend, format, titles, grid, scale, data labels, and color (the color choices, of course, include black and white).

If you have graphics display capability (that is, if you have the IBM color/graphics adapter, the Hercules or the AST monochrome graphics adapter, or a Compaq), you can view the graph you've designed. Any time your spreadsheet changes, you can re-view the graph by pressing the F10 key. The F10 key is an especially neat feature if you have both monochrome and color screens attached to your PC, because the spreadsheet will continue to be displayed on one screen while the graph appears on the other.

Know Thy PC!

Are you writing programs in BASIC or Pascal? The popular **Peeks 'n Pokes** has a disk with 58 programs and a 38-page manual that helps you get 'underneath the covers' of the PC. Learn how to use PEEK, POKE, INP, OUT, and DOS/BIOS function calls to do what you want, fast! Do you want to perform functions not available from BASIC or Pascal? It's all explained in the manual and demonstrated in the sample programs. Source code included!

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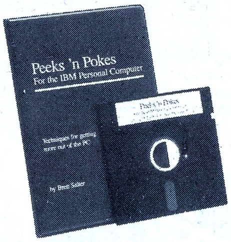

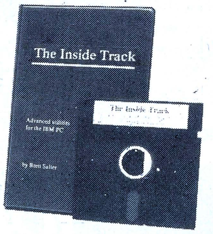

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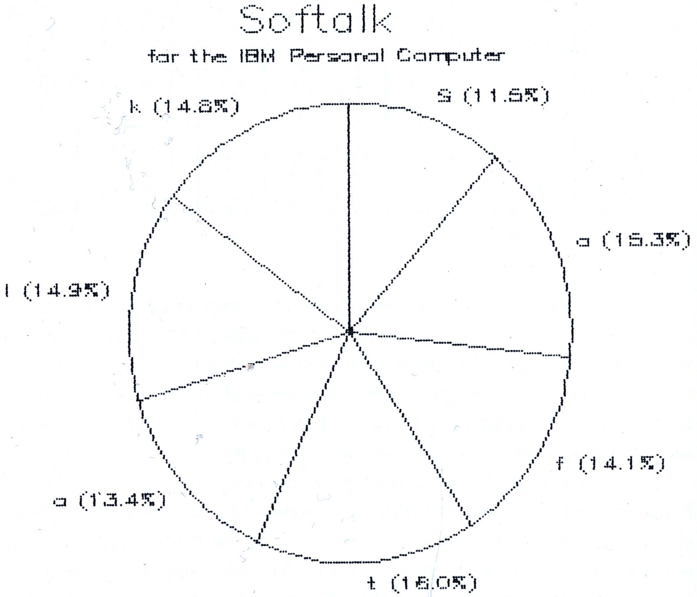
PrintGraph is a separate program that you run from the *1-2-3* access system. To start it, you exit from *1-2-3* and run PrintGraph; this requires changing floppy disks if you don't have a Winchester. PrintGraph displays a status screen showing the options and settings currently in effect. To change these you use simple menu screens that are somewhat different from the pop-up menus used for *1-2-3*'s control panel.

The first time you run PrintGraph, you'll have to indicate which graphics devices you have attached to your PC. Printers supported (as of version 1A) include the Epson FX-80 and MX80/100 with Graftrax; the IBM Graphics Printer; the Okidata 82A and 83A (with Okigraph), 92, 93, and 84; the IDS Prism 80 and 132; the Anadex 9620A; and the NEC 8023. Plotters supported are the Hewlett-Packard 7470A, the Strobe 100, and the Sweet P. The Epson, IBM, and IDS Prism printers are supported in two or more graphics print densities, and color graphics are available with the Prism printers as well as the plotters.

You also have to tell PrintGraph what fonts you want to use for the lettering and numbering of your graphs. Your font menu includes two densities of block, italic, roman, and script lettering. The font option is not available for on-screen graphics, but after you see what it can do, you might wish it were. You can also indicate that your graphs are to be printed on half or full pages, specify page size and margins, and indicate whether the program should eject a page and/or pause the printer after each graph.

You can manually select a printed graph's size or you can use PrintGraph's settings; the variable-size option can also be used to change a graph's aspect ratio (the ratio of height to width). If you really want an elliptical pie chart, for example, PrintGraph will make one for you. You can also rotate a graph any number of degrees. With a change in size and a ninety-degree rotation, PrintGraph can draw a sideways graph suitable for use as an overhead transparency.

Printers with high-resolution-graphics capability can produce PrintGraph's graphs more exactly than IBM-compatible color screens can produce *1-2-3*'s graphics. An exact translation isn't possible, but an Epson or IBM graphics printer in single-density-graphics mode will yield the equivalent of a full screen of graphics at a resolution of 480 by 350 dots. By contrast, the medium-resolution color graphics screen used by *1-2-3* is 320 by 200. The same printers can produce quadruple-density graphics at a resolution of 1,920 by 350 dots.



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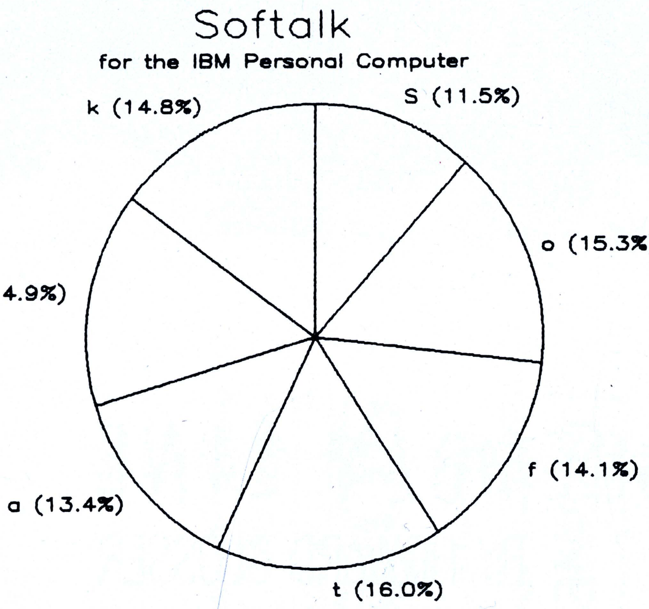
The weak link in printing graphics is, of course, speed or, rather, the lack thereof. On an IBM Graphics Printer, PrintGraph took about two minutes to print a sample low-resolution pie chart. By comparison, when you're in *1-2-3* and want to see an updated graph on-screen, you can hit the F10 key and get almost instantaneous response (few things in life are as slick as the *1-2-3* F10 key).

If you're going to use the high-density graphics, make sure you've got a fresh pot of coffee and a supply of computer magazines. The pie chart that required two minutes in low-density mode took almost twenty-four in quadruple density! But the results are worth it. In quadruple density, the circle is almost perfectly round, the diagonals are straight, and the graph is generally more pleasant to look at than the output from F10.



A good working strategy is to use *1-2-3*'s screen graphics to produce rough drawings and then use the high-density printer graphics for presentation material. The low-resolution graphics aren't of sufficient quality for reproduction (the characters are particularly weak). If you don't have the graphics screen, the low-density printer graphs will serve quite well to give you a quick look at graph output. Two minutes may seem a long time, but it's a lot less than you'd need to draw a pie chart by hand!

Postscript: Reader Virginia Shovlin, of Mentor, Ohio, informs us that there's a confusing error in the Epson MX-80 Graftrax printer manual. Even though we use the older model MX-80 in most of our examples, we thought users of the popular Graftrax model would like to be aware of the problem.

The command sequences printed in hexadecimal format on page B-2 of the user manual aren't all correct (the decimal versions are just fine). Shovlin has supplied the following replacements (which are correct):

	As printed	Correct
Escape-Q—Set right margin	1B 5B	1B 51
Escape-S—Sub/superscript on	1B 5D	1B 53
Escape-T—Sub/superscript off	1B 5E	1B 54
Escape-U—Unidirectional print	1B 5F	1B 55
Escape-W—Double-width print	1B 61	1B 57

Yes, Virginia, there are bugs in printer manuals. Thanks for letting us know. ▲

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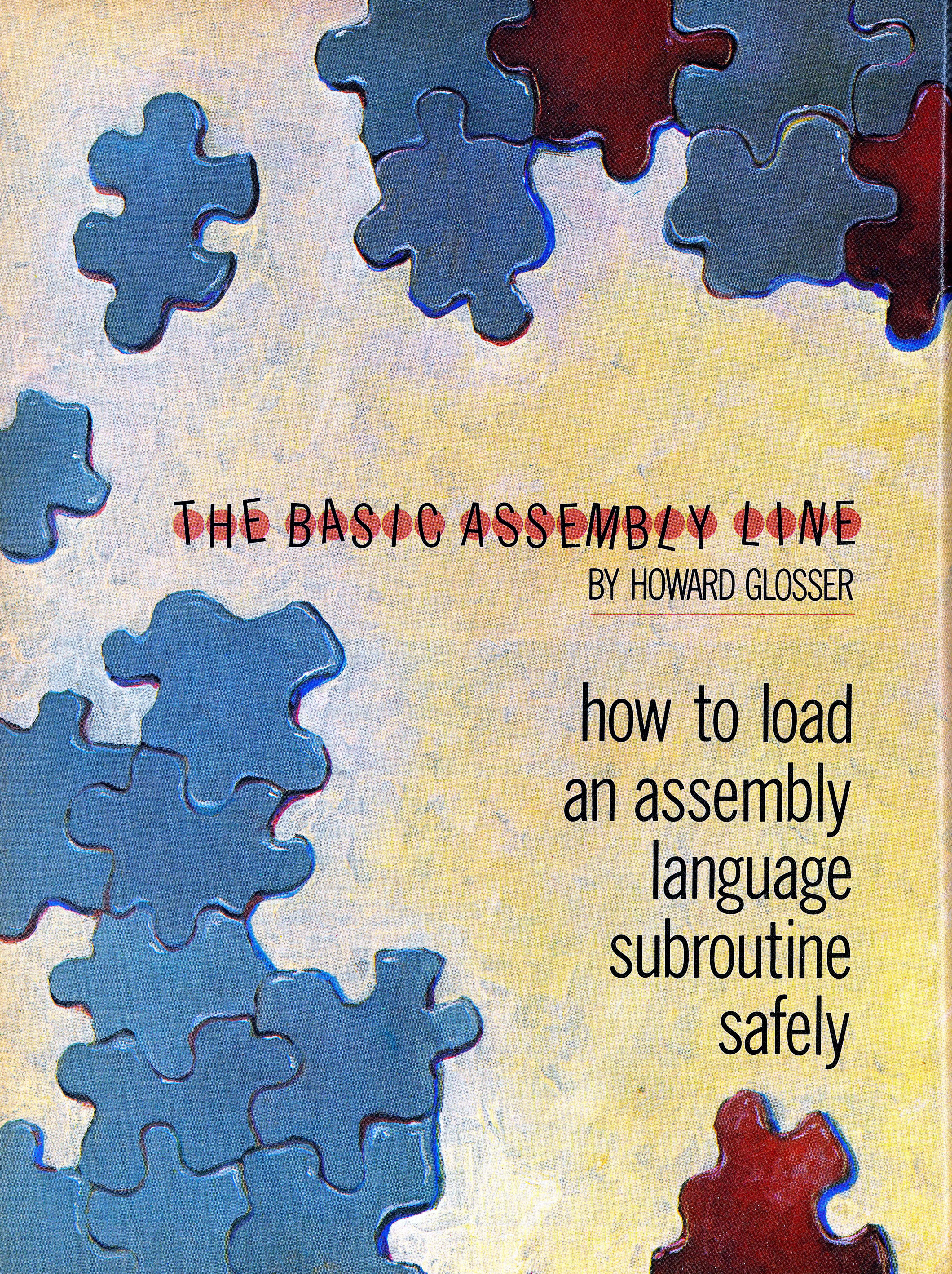

THE BASIC ASSEMBLY LINE

BY HOWARD GLOSSER

how to load an assembly language subroutine safely

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The expansion of the marketplace for PCs a
created a problem of sorts for the BASIC programm
versions of DOS in use, and with all the utilities
themselves to DOS, it's become hard to deterr
ground is. Where can you load an assembly lang
know for sure that you won't overlay BASIC's w
stack?

Once Upon a Time. . . .It used to
version of DOS was in use—bec
one version (DOS 1.0). Then alo
and things began to get interestin
said that if your machine had 64
load an assembly language subr
workspace, after having reserved the necessary
statement.

The manual also mentioned that, if your PC
could load an assembly language subroutine outside the BASIC workspace by issuing a *def seg = &H1700*. That was all fine and good.

Then came DOS 2.0, followed eventually by DOS 2.10. Now things began to get even more complicated, since, as DOS grew in size, the address at which an assembly subroutine could be safely loaded became higher and higher.

The Plot Thickens. As people discovered what the PC could do, they started writing utility programs and subroutines that did clever and exciting things—such as expand the keyboard buffer to 159 characters or prevent the screen phosphors from burning out. Such programs, however, attached themselves to DOS and in the process caused DOS to take up even more space. Now a programmer had a variety of factors to consider (which version of DOS was in use, what programs were resident, and so on) when attempting to determine the correct place to load an assembly language subroutine.

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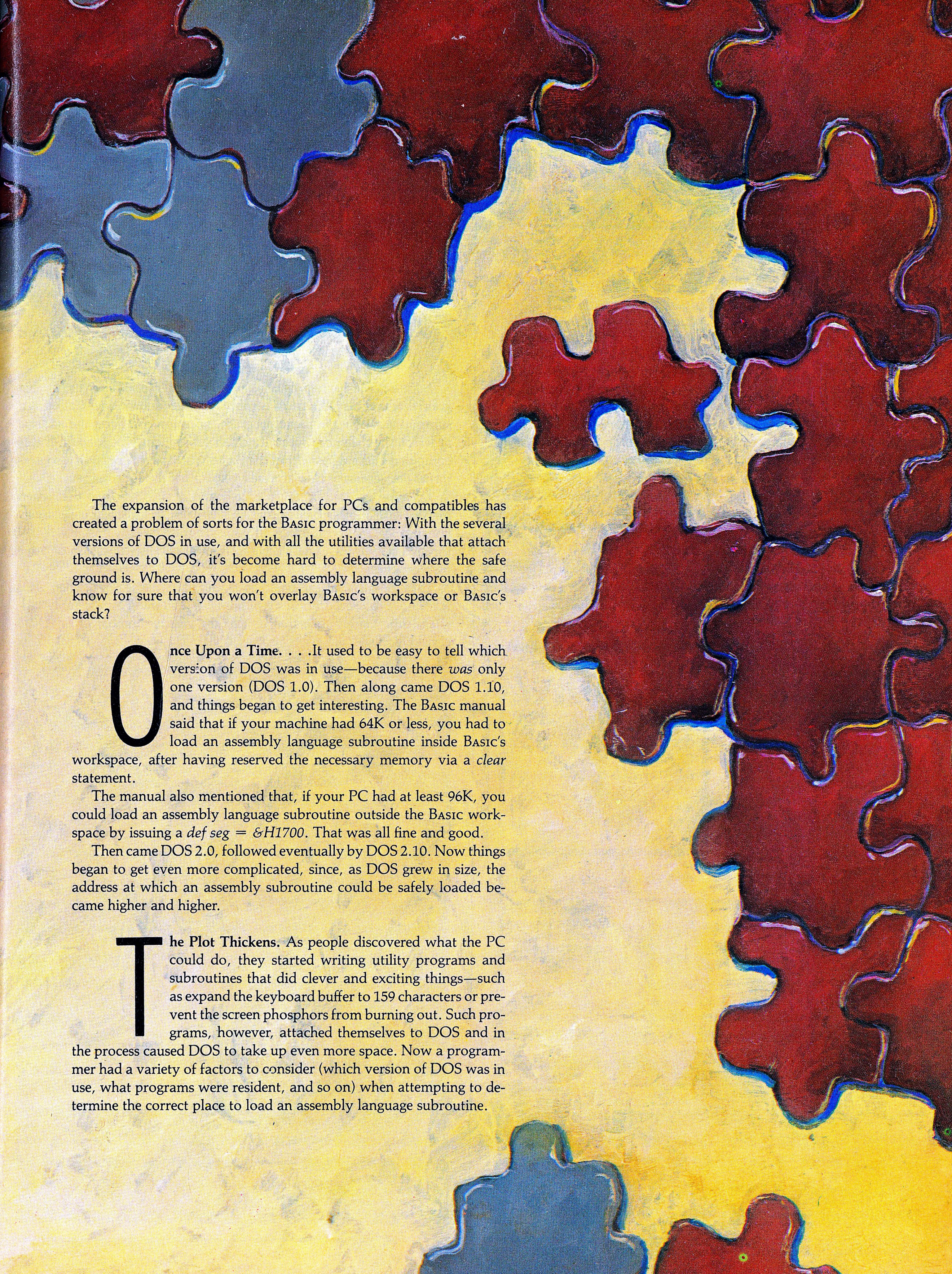

The expansion of the marketplace for PCs and compatibles has created a problem of sorts for the BASIC programmer: With the several versions of DOS in use, and with all the utilities available that attach themselves to DOS, it's become hard to determine where the safe ground is. Where can you load an assembly language subroutine and know for sure that you won't overlay BASIC's workspace or BASIC's stack?

Once Upon a Time. . . . It used to be easy to tell which version of DOS was in use—because there *was* only one version (DOS 1.0). Then along came DOS 1.10, and things began to get interesting. The BASIC manual said that if your machine had 64K or less, you had to load an assembly language subroutine inside BASIC's workspace, after having reserved the necessary memory via a *clear* statement.

The manual also mentioned that, if your PC had at least 96K, you could load an assembly language subroutine outside the BASIC workspace by issuing a *def seg = &H1700*. That was all fine and good.

Then came DOS 2.0, followed eventually by DOS 2.10. Now things began to get even more complicated, since, as DOS grew in size, the address at which an assembly subroutine could be safely loaded became higher and higher.

The Plot Thickens. As people discovered what the PC could do, they started writing utility programs and subroutines that did clever and exciting things—such as expand the keyboard buffer to 159 characters or prevent the screen phosphors from burning out. Such programs, however, attached themselves to DOS and in the process caused DOS to take up even more space. Now a programmer had a variety of factors to consider (which version of DOS was in use, what programs were resident, and so on) when attempting to determine the correct place to load an assembly language subroutine.

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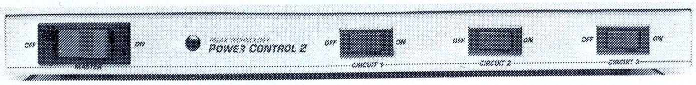

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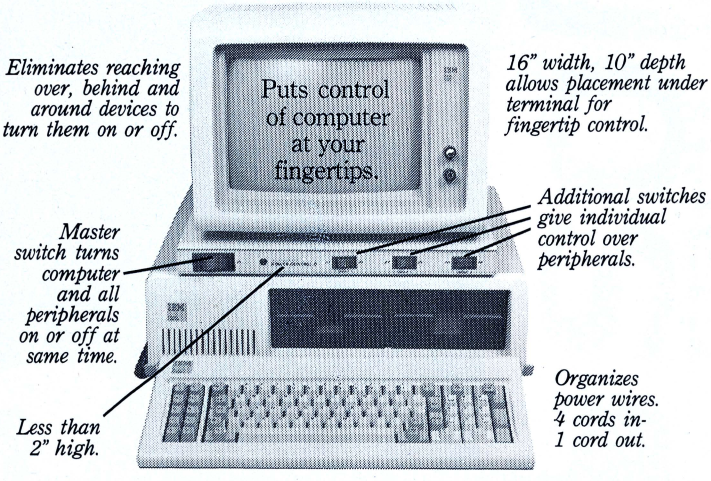
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Most BASIC programs using assembly language subroutines employ a default load address procedure that looks something like this:

```
10 CLEAR ,32768!       ' Use this statement on 64K machines only
20 DEF SEG = &HF00     ' Use &H1700 on machines with 96K
                         or more
```

Unfortunately, on a 96K machine running DOS 2.0 or on a system that has a multitude of DOS attachments in place, this default address doesn't work. It causes the loaded subroutine either to work incorrectly or to lock up the machine.

The Location Solution. This month's "BASIC/Assembly Line" is a response to a problem of this kind reported by Pat Pannese of Boston, Massachusetts. Pannese was getting errors when he used the Shellsrt routine ("The BASIC/Assembly Line," March 1984); he discovered that the load address given in that article (*def seg = &H1700*) didn't work correctly under DOS 2.0 in his machine.

Location is a BASIC program that's merged into another BASIC program that intends to call an assembly language subroutine. Called as a subroutine within the BASIC program, Location computes the address at which the assembly subroutine can subsequently be loaded. If this computed address lies within the BASIC workspace, Location also performs the necessary *clear* to reserve space for the subroutine.

Location is listed in figure 1. It begins at line 59000 so that when merged with another BASIC program it will not, in most instances, overlay any existing line numbers. If your program already has lines 59000 through 60490, then you'll have to renumber either Location or your own program.

Let's look first at the BASIC code and see what it does. Then we'll learn how to use Location by building and running an assembly language utility subroutine that returns the version number of the DOS currently in use.

```
59000 '===============================================================
59010 '
59020 '    ** LOCATION **
59030 '
59040 '    Written by Howard Glosser
59050 '
59060 '    This program will locate an area in memory where an ASM
59070 '    subroutine that is to be called from BASIC can safely
59080 '    be loaded; it will perform a CLEAR if necessary and will
59090 '    return the DEF SEG address in variable LD.ADDR. After
59100 '    merging this program into your BASIC program...
59110 '
59120 '            1. Place the size of your subroutine (rounded up to a 16-
59130 '               byte boundary) into variable SUBR.SIZE on line 60210.
59140 '               Example: If subroutine is 22 bytes, use 32.
59150 '
59160 '            2. Call LOCATION at the very start of your program using
59170 '               GOTO 60000. Use a GOTO, as opposed to a GOSUB,
59180 '               since the LOCATION subroutine will destroy GOSUB
59190 '               linkage if it issues a CLEAR statement.
59200 '
59210 '            3. If your program has any DEF SEG = that specifies
59220 '               where to load an ASM subroutine, change it to
59230 '               DEF SEG = LD.ADDR. Also remove any CLEAR command
59240 '               that your BASIC program already has.
59250 '
59260 '            4. In LOCATION, change line 60160 to make it GOTO the
59270 '               line number that follows the line number in your program
59280 '               in which the GOTO for LOCATION occurs (see 2 above).
59290 '
59300 '            5. Finally, after MERGING, DELETE 59000 - 59390. This
59310 '               will erase this documentation from the program.
59320 '
59330 '         NOTE: Each time this program is run, if the ASM subroutine
59340 '               is loaded INSIDE the BASIC data segment, it will reduce
59350 '               the size of the workspace available for BASIC by the
59360 '               number of bytes in SUBR.SIZE. Therefore, run LOCATION
59370 '               only once within a program.
59380 '
59390 '===============================================================
60000 '
60010 '   **** LOCATION SUBROUTINE ****
60020 '
60030 TRUE% = -1 : FALSE% = 0 : LDOUT% = FALSE%
60040 GOSUB 60180 : GOSUB 60230 : GOSUB 60270
60050 IF NOT LDOUT% THEN 60130
60060 '
60070 '   ** Set DEF SEG for loading outside BASIC data segment
60080 '
60090 GOSUB 60340 : GOTO 60160
60100 '
60110 '   ** Set CLEAR and DEF SEG for inside BASIC data segment
60120 '
60130 GOSUB 60380
60140 CLEAR ,CLR.ADDR
60150 GOSUB 60180 : GOSUB 60430
60160 GOTO XXXXX                        'Insert line number for return
```

```
60170 END
60180 '
60190 '   ** Get size of subroutine
60200 '
60210 SUBR.SIZE = XXX                    'Insert subroutine size here
60220 RETURN
60230 '
60240 '   ** Find amount of memory in system
60250 '
60260 DEF SEG = 0 : SYS.MEMORY = PEEK(&H413) + PEEK(&H414) * 256 : RETURN
60270 '
60280 '   ** See if subroutine can be loaded outside BASIC data segment
60290 '
60300 DEF SEG = 0 : BASIC.DS = (PEEK(&H510) + PEEK(&H511) * 256)
60310 OUTSIDE.BASIC.DS = BASIC.DS + 4104 + (SUBR.SIZE / 16)
60320 IF OUTSIDE.BASIC.DS * 16 < SYS.MEMORY * 1024 THEN LDOUT% = TRUE%
60330 RETURN
60340 '
60350 '   ** Set DEF SEG to load outside of BASIC data segment
60360 '
60370 LD.ADDR = OUTSIDE.BASIC.DS - (SUBR.SIZE / 16) : RETURN
60380 '
60390 '   ** Set up CLEAR statement
60400 '
60410 DEF SEG : TOP.STACK = PEEK(&H2C) + PEEK(&H2D) * 256
60420 CLR.ADDR = (TOP.STACK - SUBR.SIZE) - 128 : RETURN
60430 '
60440 '   ** Set DEF SEG to load inside BASIC data segment
60450 '
60460 DEF SEG = 0 : BASIC.DS = 16 * (PEEK(&H510) + PEEK(&H511) * 256)
60470 DEF SEG : TOP.STACK = PEEK(&H2C) + PEEK(&H2D) * 256
60480 LD.ADDR  = (BASIC.DS + TOP.STACK ) / 16
60490 LD.ADDR  = INT (LD.ADDR + .5) : RETURN
```

Figure 1.

How Location Locates. Lines 59000 through 59390 provide information on how to use the program; we'll discuss these when we get ready to run our example. The program code begins at line 60000. We'll follow the logic line by line to see what's happening and to learn a little about how Basic's workspace is set up.

Line 60030 sets up values for variables True%, False%, and Ldout%, the last being a variable that will be set true (−1) if the assembly language subroutine can be loaded outside the Basic workspace or false (0) if it must be loaded within. Line 60040 performs a *gosub* to 60180, where the size of the assembly language subroutine is retrieved (you would have set this before running Location). Next on line 60040 is a *gosub* to 60230. This subroutine looks into the ROM BIOS data area (specified by the *def seg = 0*) and retrieves the amount of memory in the system (expressed in kilobytes); it stores that value in variable Sys.memory. Finally in line 60040 we have a *gosub* to 60270; the subroutine there is the key to how Location works. Before we get to a discussion of this section, let's look at the memory map in figure 2 to see just how Basic fits into the picture.

As we begin our discussion, we need to define a few terms. The first term is *paragraph*. A paragraph is sixteen bytes. The paragraph is a convenient quantity on the PC because of the fact that the 8088's registers are sixteen bits wide, while address values may range all the way up to hex FFFFF—a twenty-bit quantity. In order to stuff a twenty-bit quantity into a sixteen-bit register, you need to divide the twenty-bit quantity by 16; doing this is tantamount to expressing the absolute address (that twenty-bit quantity) as a certain number of sixteen-bit chunks—paragraphs. Segment addresses are usually specified in this manner. Sometimes the size of an assembly language subroutine is also expressed in paragraphs instead of in bytes. A 1,024-byte subroutine, for example, is sixty-four paragraphs in size (1,024 / 16 = 64).

The second term is *physical address*. This is the segment address multiplied by 16 and denotes the absolute address of a segment or the absolute address at which a routine is stored. For example, the physical address of a segment whose paragraph address is hex 65B (decimal 1627) is hex 65B times 16, or hex 65B0 (decimal 26032).

Addresses in the PC are normally written in *segment:offset* form. That is, they are expressed as a segment paragraph number plus some number of additional bytes (both the segment and the offset are written in hex). For example, 0040:0013 specifies an address that is nineteen (hex 0013) bytes away from the beginning of the segment that starts at paragraph 0040. The physical, or absolute, address of paragraph 0040 is 00400 (multiplying any hex number by 16 is like multiplying any decimal number by 10; you just add a 0 on the right). So the physical address indicated by 0040:0013 is hex 00400 plus hex 0013, or hex 00413 (this would most commonly be written simply 413H).

Now let's look at the memory map.

Notice that the distance from the beginning of the Basic data segment to the top of the Basic stack can be, at most, 64K. This area of memory is Basic's *workspace*. Its size depends on how much memory you have in your system. Looking at the map, we can see that the beginning address of Basic's data segment will vary, depending on what version of DOS is in use and on the presence of any DOS-resident programs in low memory. So in order to know where it's safe to load an assembly subroutine and whether the load address will be inside or outside the Basic workspace, you must find out where the Basic data segment actually begins; all your calculations will be based on that information.

Determining the start of Basic's data segment is the job done by the subroutine at line 60300 in Location. We find this address, stored as a segment address, at locations 510H and 511H, which are within the ROM BIOS data area. After we've found that address, line 60310 of our program will compute the address we'll need to use if our subroutine is to be loaded outside the Basic data segment.

This computation is done as follows: We take the beginning address of the data segment, add to it 64K, add an additional 128 bytes for safety, and finally add the size of the assembly subroutine (all these values are expressed as numbers of paragraphs). In line 60310, the computations are expressed in this manner:

OUTSIDE.BASIC.DS = BASIC.DS + 4104 + (SUBR.SIZE / 16)

The total computed by line 60310 is equal to the lowest possible ending address for our subroutine; if this address is outside the range of memory we have available, then our subroutine won't fit.

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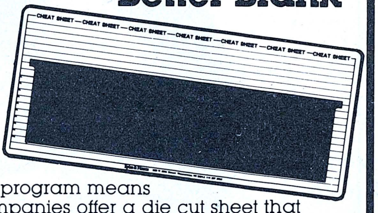
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In line 60320, the address just computed (Outside.basic.ds) is multiplied by 16 to yield the physical address. This value is then compared with the value of Sys.memory multiplied by 1,024 (Sys.memory multiplied by 1,024 represents the total amount of memory in the system). If the physical address is less than the amount of memory in the system, then Ldout% is set to True% (−1). If there isn't enough memory in the system, then Ldout% is left equal to False%; this, of course, means that the subroutine will have to be loaded within the BASIC data segment.

Returning to line 60050, the program checks the value of Ldout%. If the subroutine is to be loaded outside the data segment, line 60370 sets variable Ld.addr to the address of Outside.basic.ds minus the size of the subroutine—in paragraphs. As a result, the assembly subroutine will be loaded just above the BASIC data segment (with a buffer of 128 bytes for safety). When the assembly subroutine can be loaded outside the BASIC data segment, it's advantageous to put it there; doing so leaves more space inside the data segment for our BASIC program and its variables.

After Ld.addr has been set, it's just a matter of branching to the *goto* on line 60160, which previously will have been set to return control to the BASIC program line that follows the *goto* to Location.

If there's not enough memory to allow us to load the subroutine inside the BASIC data segment, the code on line 60130 performs a *gosub* to 60380. The code there retrieves the top of stack's offset within the BASIC data segment and computes a Clr.addr; the value of Clr.addr will be the top of stack less the size of the subroutine. This done, line 60140 then performs the *clear*.

When the *clear* is executed, two significant things take place. First, the offset for the top of the BASIC stack is adjusted to the value specified in the *clear* command. This effectively reduces the size of the BASIC workspace and reserves a space following the stack for the assembly subroutine (see figure 2). Whatever we put in this reserved area is protected from accidental overlay by BASIC. For example, if the top-of-stack address is 36864, and we do a *clear ,32768!*, the top of stack becomes 32768, and we're left with a 4K reserved area at the top of the data segment into which we can load a subroutine.

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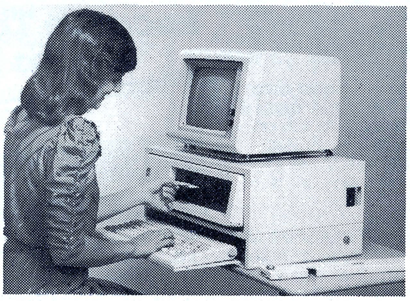

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The *clear* also sets all numeric variables to 0 and all string variables to null values. For this reason, Location must be the first operation performed in any program. Otherwise, all values thus far assigned are lost.

Once we've reserved an area within the BASIC data segment into which we may safely load our subroutine, all we have to do is compute the physical address of the beginning of this reserved area and set Ld.addr to this value.

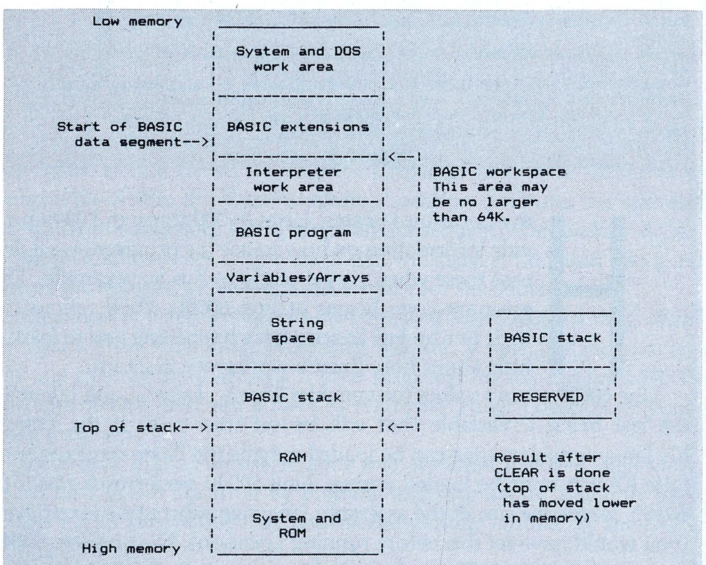


Figure 2.

Returning to line 60150, we find a *gosub* to line 60180. This is where we retrieve the size of the assembly subroutine, since we lost it when we executed the *clear* statement. At line 60460 we again retrieve the address of the BASIC data segment; note, however, that this time we compute the physical address by multiplying the address stored at hex 510 and 511 by 16.

Next, the top of stack (now adjusted by the *clear*) is retrieved and is used to compute the load address. To the BASIC data segment (a segment address) we add the top-of-stack address (an offset into BASIC's data segment). The physical address thus calculated is then divided by 16 to give us a segment address that we can use in a *def seg* statement (*def seg* addresses are always specified as paragraph addresses). Finally, we round the load address up, change it to an integer value, and leave the result in variable Ld.addr.

Location in Operation. The first step in using Location is to key in the program displayed in figure 1 and save it in ASCII format. (Any program that you want to merge into another program must be in ASCII; use *save "location",a* to do this.)

Figure 3 lists a program whose data statements build an assembly utility subroutine called Version; you can call this subroutine from BASIC to retrieve the version number of DOS currently in use on a system. Let's see how we can combine Location with the program in figure 3 to set the load address (*def seg*) for the Version subroutine.

The lines of documentation (59000 through 59390) in figure 1 supply the information necessary to use Location. To start, key the program in figure 3 into your machine, place the disk containing Location in drive B, and merge the Location program:

MERGE "B:Location"

Next, place the size of the assembly subroutine, rounded up to the nearest sixteen bytes (the value in Subr.size must be evenly divisible by 16), into line 60210. Since our subroutine is 75 bytes long, we'll place the value 80 in Subr.size.

In DOS 1.1 directory listings, file sizes are rounded up to 128-byte multiples. If you know the actual size of a subroutine, use that figure instead of the figure given in the directory list. Whatever you do, make sure you set Subr.size equal to or greater than the actual size of your subroutine.

```
10 '     ***** VERSION *****
20 '
30 '     This subroutine displays
40 '     the version of DOS in use
50 '
60 '     Written by Howard Glosser
70 '
80 '     ***** THIS BUILDS AND CHECKS THE SUBROUTINE
90 '
100 CLS : GOSUB 60000
110 PRINT "Creating VERSION Subroutine..."
120 '
130 CHECKCNT% = 0
140 LINENO% = 1030
150 '
160 DEF SEG = LD.ADDR
170 LOCATE 3,1,0 : COLOR 18 : PRINT "Reading DATA Statements..." : COLOR 7
180 FOR MEM% = 0 TO 79
190      READ DT%
200      IF CHECKCNT% = 8 THEN GOSUB 300 : READ DT%
210      IF DT% > 255 THEN 500
220      IF DT% < 0 THEN CHECKSUM% = DT% : GOSUB 370 : GOTO 470
230      POKE MEM%,DT%
240      CHECKSUM% = CHECKSUM% + DT%
250      CHECKCNT% = CHECKCNT% + 1
260      GOTO 470
270 '
280 '   ** THIS PERFORMS CHECKSUM BY LINE
290 '
300      IF CHECKSUM% <> DT% THEN 510
310      LINENO% = LINENO% + 10
320      CHECKCNT% = 0 : CHECKSUM% = 0
330      RETURN
340 '
350 '   ** FILL MEMORY MODULE
360 '
370      FILL% = ABS(DT%)
380      READ DT%                    'Character read here used for filling memory
390      FOR FILLOOP% = 1 TO FILL%
400          POKE MEM%,DT%
410          MEM% = MEM% + 1
420      NEXT
430      CHECKSUM% = CHECKSUM% + DT%
440      READ DT% : GOSUB 300
450      MEM% = MEM% - 1
460      RETURN
470 NEXT
480 READ DT% : GOSUB 300
490 GOTO 550
500 PRINT "DATA OUT OF RANGE (MUST BE 0 to 255)"
510 BEEP : PRINT "ERROR in DATA STATEMENT - Check line " LINENO% : END
520 '
530 '   ***** THIS SAVES THE SUBROUTINE
540 '
550 BSAVE "VERSION",0,75
560 LOCATE 3,1,1 : PRINT "VERSION subroutine created"
570 END
1000 '
1010 '   ***** DATA STATEMENTS TO BUILD SUBROUTINE
1020 '
1030 DATA     85,  139,  236,  180,   48,  205,   33,  134, 1060
1040 DATA    196,  128,  252,    2,  115,    4,   51,  219,  967
1050 DATA    235,    3,  232,    9,    0,  139,  126,    6,  750
1060 DATA    137,   29,   93,  202,    2,    0,   51,  219,  733
1070 DATA    190,   10,    0,   80,  177,    8,  211,  232,  908
1080 DATA    232,    9,    0,  134,  251,   88,   50,  228,  992
1090 DATA    232,    1,    0,  195,   51,  210,  247,  246, 1182
1100 DATA     11,  192,  117,    2,  235,   10,    2,  218,  787
1110 DATA     51,  210,  247,  246,  177,    4,  210,  226, 1371
1120 DATA      2,  218,  195,    0,    0,    0,    0,    0,  415
```

Figure 3.

Next, note that line 100 in figure 3 includes a *gosub 6000.* This line number is where the Location subroutine gets run. In line 160, note that the *def seg* is set to Ld.addr, the variable in which Location will return the load address to be used. You'll have to change both of these statements—line 100 and line 160—in any program where you intend to use Location to arrive at the correct load address. You'll also need to remove any *clear* commands that your Basic program already has (be sure you don't remove the *clear* command in the Location portion, however). At line 60160, insert the line number that you want to return to when Location has finished (in this case, it's line 110). Finally, if you prefer to do without all the comments, delete them. Once you've made all necessary changes, you can save the program in figure 3 to disk.

Finally, a word of warning. If Location performs a *clear* (this is most likely to happen on a 64K system), it reduces the size of Basic's workspace by the value of Subr.size. It does this each time you run it; therefore, execute Location only once in a program (or else you'll quickly eat up the Basic workspace).

We'll be referring to the Location subroutine and suggesting its use with assembly language subroutines that appear subsequently in this series. Recognizing that new readers join us each month, we'll continue to supply a default *def seg* address, but, with all the variables to consider, we can't guarantee that the default will work for everyone. To be safe, use the Location subroutine if you possibly can.

Now we're ready to run the program that builds Version. Load and run the file you earlier saved to disk (figure 3). You'll get the message "VERSION subroutine created", and the subroutine will be saved on disk. While this might not seem too impressive, what's actually happened is considerable: The Location subroutine has determined where to load Version; the *def seg* has pointed to that physical load address; the Basic program has read the machine language code into that area; and the *bsave* has put the subroutine to disk.

If you're curious about the actual load address that was used, you may (after the program has run) type *print ld.addr.* The value used for the *def seg* will be displayed; to get the physical address, multiply by 16.

If, when the program is running, you receive the message "DATA OUT OF RANGE (MUST BE 0 TO 255)", chances are you omitted a comma somewhere in the data statements. (This error message is new to the build routine; it was added in response to a suggestion from Ed Madory of Poughkeepsie, New York.) If you've miskeyed a data item, the checksum logic for each data statement will catch your error, the message on line 510 will be displayed, and a tone will sound. Once you've successfully created the subroutine, we can move on to a demonstration of Version.

What Version Do We Have? The program in figure 4, when run, displays the version of DOS being used. Key it in, save it to disk, and then make the changes outlined previously to include Location within it. Here's a quick summary of the steps you need to take (items 3, 4, and 5 have already been done for you):

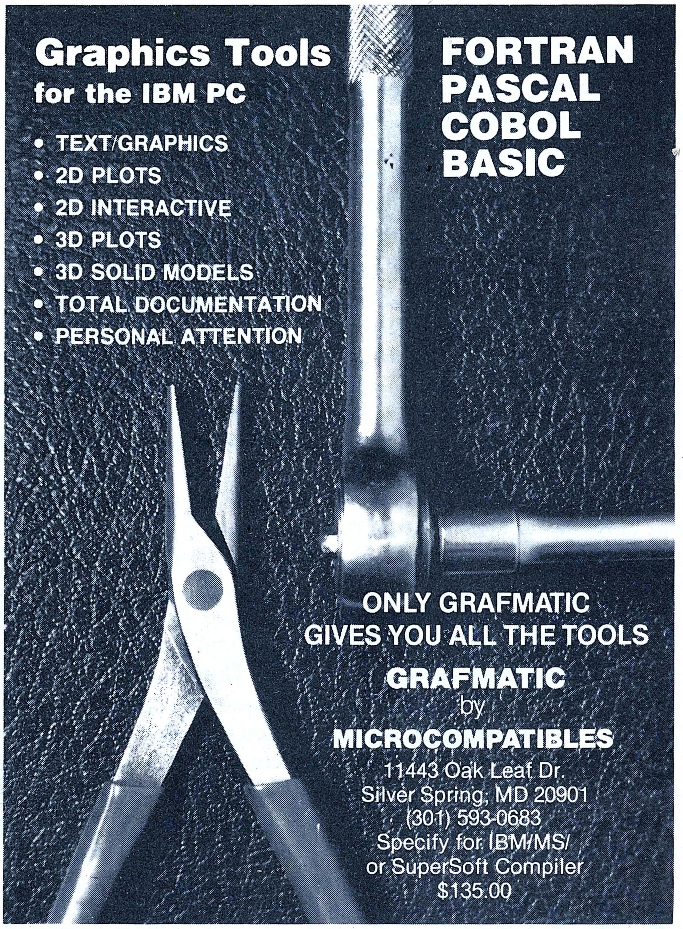
1. Merge Location into the Basic program.
2. Place the size of the subroutine into line 60210.
3. Put a *goto 60000* at the start of the program.
4. Change any *def seg* value to reference Ld.addr.
5. Remove any *clear* command the program may already have.
6. Change line 60160 to *goto* your program.
7. Delete the comments in Location.

After you've done all this, run the Basic program. You'll receive a message stating "Current version of DOS is" followed by either the version number or the message "prior to 2.00." You might want to run the Version subroutine prior to executing commands—such as *shell*—that would result in syntax errors in certain versions of DOS.

```
10 '     ***** THIS PROGRAM DEMONSTRATES VERSION
20 '
30 '     ** DEFINE SEGMENT AND LOAD VERSION
40 '
50 KEY OFF : GOTO 60000
60 DEF SEG = LD.ADDR
70 BLOAD "VERSION",0
80 VERSION = 0
90 '
100 '    ** CLEAR SCREEN AND DEFINE VARIABLES
110 '
120 CLS
130 VER% = 0
140 LOCATE 1,15 : PRINT " ** DEMONSTRATE VERSION SUBROUTINE ** " : PRINT
150 '
160 CALL VERSION (VER%)
170 '
180 LOCATE 3,5 : PRINT "Current version of DOS is ";
190 IF VER% = 0 THEN PRINT "prior to 2.00" : GOTO 210
200 VER = VAL(HEX$(VER%)) * .01 : PRINT USING "##.##";VER : PRINT
210 END
```

Figure 4.

The Location subroutine will *not* work in compiled Basic, since the compiler and interpreter handle program and variable storage in different ways. The Version subroutine, however, will work in com-



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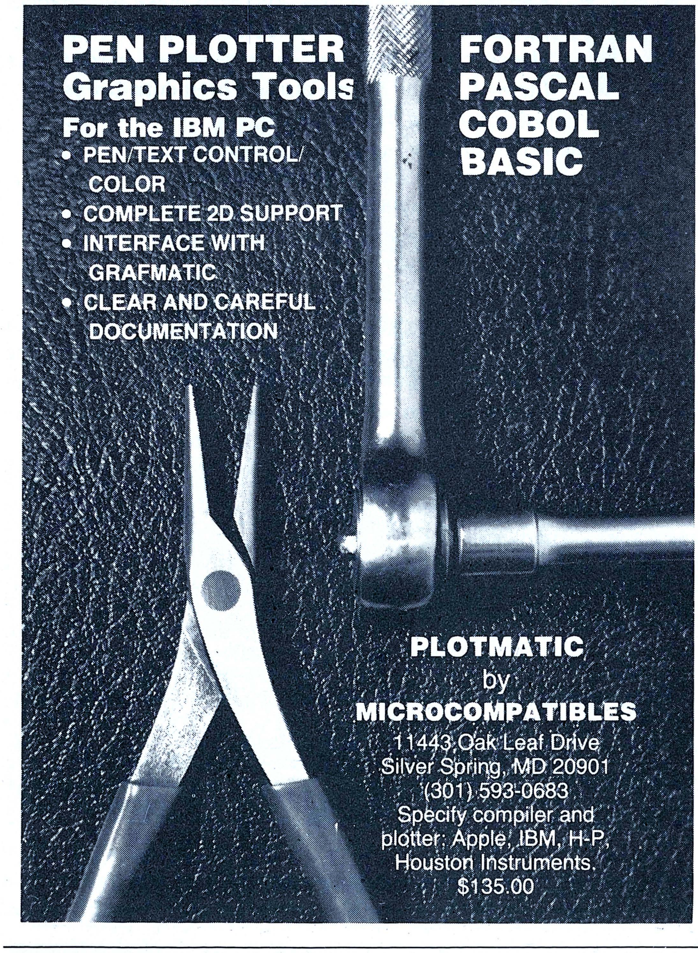

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piled Basic provided that you specify an actual value (instead of a variable) for the *def seg* address, change line 80 to *version% = 0*, and change line 160 to *call absolute (ver %, version %)*. In the future, whenever possible, we'll indicate the modifications necessary to make subroutines published here work in compiled Basic.

The final listing we'll look at is figure 5, the assembly program that retrieves the DOS version number. This routine uses DOS function call 30H, which returns in the AX register the current version of DOS in use. The major version number is in AL; the minor is in AH. If AL contains 0, then the version is earlier than DOS 2.0, since versions of DOS prior to 2.0 didn't provide their version numbers.

The program swaps AL and AH to simplify comparison. If the version number returned in register AX is valid (DOS 2.0 or later), the program converts the major and minor portions of the version number to a decimal figure and stores the figure in register BX. For example, in the case of DOS 2.1, function call 30H returns AL = 02 and AH = 0A (10 decimal). For the purposes of our Basic program, this number must be 210 hex before it can be returned from the Version subroutine. This is accomplished by means of the convert routine on lines 29 through 41.

The convert process clears the DX register, since the divide operation we're about to do involves the AX:DX register combination. The divisor is set to 10 in SI, and the first divide is done on the major portion of the version number. The result of this is the 1s position of a decimal number, and this result is stored in BL.

The AX register is ORed to see if anything is left to divide. If anything is, DX is cleared again, the division is done, and this time the result in DL is shifted left four bits to give us the value at the 10s position. This too is added to BL. The whole process is then repeated for the minor portion of the version number.

After the convert procedure has been executed, the BX register will contain 210 hex (528 decimal), and this number is returned to Basic in variable Ver%. In the case of pre-2.0 DOS, the BX register is cleared and Ver% contains 0.

If the Basic program finds Ver% equal to 0, it issues the "prior to 2.00" message. Otherwise, it takes Ver% (which is decimal), converts it back to hex, takes the *val* of that and multiplies it by .01 to set the decimal point (2.10); finally, it reports *this* number via a *print using* statement.

A Minor Correction. Robert Johnson brought to our attention a minor error in the Shellsrt program that was published in the March issue. Johnson indicates that picking up the lengths of the string variables in lines 113 and 121 of the assembly language listing puts garbage in the high part of the CX register, because the length in the descriptor is only one byte, and a CX instruction picks up two bytes. The result is an exceptionally large value in the CX register, which is used for the duration of the compare on line 134. In most instances this causes no problem; but if you want to fix it, it's easy to do. In the Basic program listing, change the following two lines:

```
750 DATA   139,  15,  46, 136,  14,  16,   0, 139, 505
780 DATA    46, 136,  14,  18,   0, 139, 119,   1, 473
```

These changes result in the following assembly listing:

```
114  00FA  2E: 88  0E  0010 R  MOV BYTE PTR LEN1,CL
122  0110  2E: 88  0E  0012 R  MOV BYTE PTR LEN2,CL
```

With these changes made, only the low-order portion of the CX register (which contains the actual length) will be stored in variables LEN1 and LEN2.

We want to thank all those readers who have written with comments and suggestions. Some have indicated that certain of the subroutines in the "Basic/Assembly Line" can be done using the Basic *shell* command under

DOS 2.0. For example, the following program, which uses *shell* to retrieve the amount of space on a disk, was sent in by Daniel Tanner of New York City, New York:

```
 10  T1 = PEEK(&H30) : T2 = PEEK(&H31)
 20  SHELL "chkdsk a: >b:fil1.dat"
 30  POKE &H30,T1 : POKE &H31,T2
 40  OPEN "b:fil1.dat" FOR INPUT AS #1
 50  FOR I = 1 TO 8
 60    INPUT #1,A$
 70  NEXT
 80  BYTENO = VAL(MID$(A$,1,6))
 90  PRINT "Bytes available";BYTENO
100  END
```

This is indeed a good way to find out how much disk space you have—provided, of course, that you're working in DOS 2.

Next time: a look at a subroutine allowing files to be copied or backed up from within Basic. ▲

```
                          ; VERSION
                          ;
                          ; This subroutine will return the
                          ; current VERSION of DOS in use
                          ;
                          ; WRITTEN BY HOWARD GLOSSER
                          ;
0000                      CSEG      SEGMENT PARA PUBLIC 'CODE'
                                    ASSUME CS:CSEG
0000                      VERSION   PROC FAR
0000  55                            PUSH BP           ;SAVE BP REGISTER FOR RETURN
0001  8B EC                         MOV BP,SP         ;MOVE STACK POINTER TO BP
0003  B4 30                         MOV AH,30H        ;SET AH FOR FUNCTION CALL 30H
0005  CD 21                         INT 21H           ;DOS INTERRUPT
0007  86 C4                         XCHG AL,AH        ;SWAP AL AND AH REGISTERS
0009  80 FC 02                      CMP AH,2          ;IS IT DOS 2.00 OR GREATER?
000C  73 04                         JAE DOS20         ;YES - GO RETURN THE VALUE
000E  33 DB                         XOR BX,BX         ;NO - CLEAR BX REGISTER
0010  EB 03                         JMP SHORT ENDVER  ;JUST RETURN TO BASIC
0012                      DOS20:
0012  E8 001E R                     CALL CONVERT      ;CHANGE TO DECIMAL FIGURE
0015                      ENDVER:
0015  8B 7E 06                      MOV DI,[BP]+6     ;POINT DI AT PARM 1
0018  89 1D                         MOV [DI],BX       ;MOVE VERSION NUMBER TO VER%
001A  5D                            POP BP            ;RESTORE BP
001B  CA 0002                       RET 2             ;RETURN WITH 1 PARM ON STACK
001E                      VERSION   ENDP
                          ;
001E                      CONVERT   PROC NEAR
001E  33 DB                         XOR BX,BX         ;CLEAR BX REGISTER
0020  BE 000A                       MOV SI,10         ;PLACE DIVISOR IN SI
0023  50                            PUSH AX           ;STORE AX REGISTER
0024  B1 08                         MOV CL,8          ;MOVE 8 TO CL FOR SHIFT
0026  D3 E8                         SHR AX,CL         ;SHIFT AX 8 BITS RIGHT
0028  E8 0034 R                     CALL DIVIDE       ;DO DIVIDE
002B  86 FB                         XCHG BH,BL        ;SWAP BH AND BL REGISTERS
002D  58                            POP AX            ;RESTORE AX
002E  32 E4                         XOR AH,AH         ;CLEAR AH REGISTER
0030  E8 0034 R                     CALL DIVIDE       ;DO DIVIDE
0033  C3                            RET
0034                      CONVERT   ENDP
                          ;
0034                      DIVIDE    PROC NEAR
0034  33 D2                         XOR DX,DX         ;CLEAR DX
0036  F7 F6                         DIV SI            ;DIVIDE AX BY SI
0038  0B C0                         OR AX,AX          ;ARE WE DONE?
003A  75 02                         JNZ NEXTDIV       ;NO - DIVIDE AGAIN
003C  EB 0A                         JMP SHORTEXITDIV  ;YES - END DIVIDE
003E                      NEXTDIV:
003E  02 DA                         ADD BL,DL         ;ADD FIGURE IN DL TO BL
0040  33 D2                         XOR DX,DX         ;CLEAR DX
0042  F7 F6                         DIV SI            ;DIVIDE AX BY SI
0044  B1 04                         MOV CL,4          ;MOV 4 TO CL FOR SHIFT
0046  D2 E2                         SHL DL,CL         ;SHIFT DL LEFT 4 BITS
0048                      EXITDIV:
0048  02 DA                         ADD BL,DL         ;ADD FIGURE IN DL TO BL
004A  C3                            RET
004B                      DIVIDE    ENDP
                          ;
004B                      CSEG      ENDS
                                    END
```

Figure 5.

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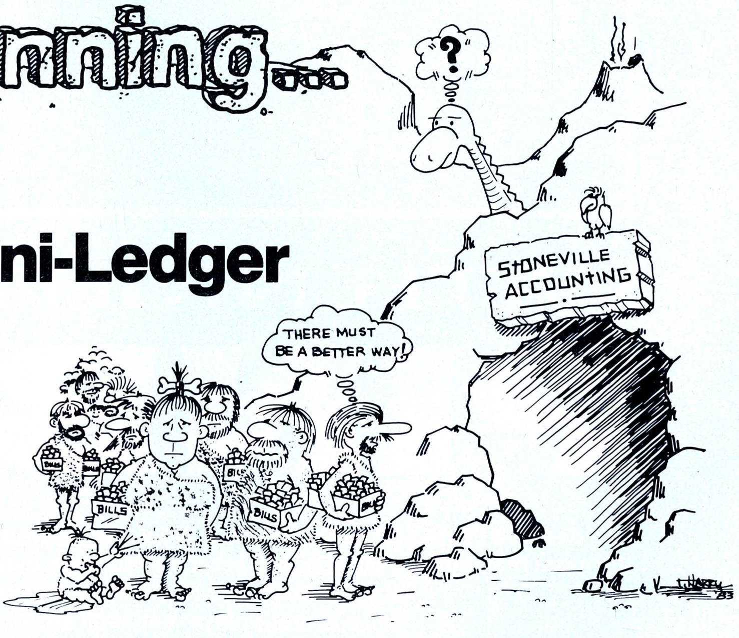

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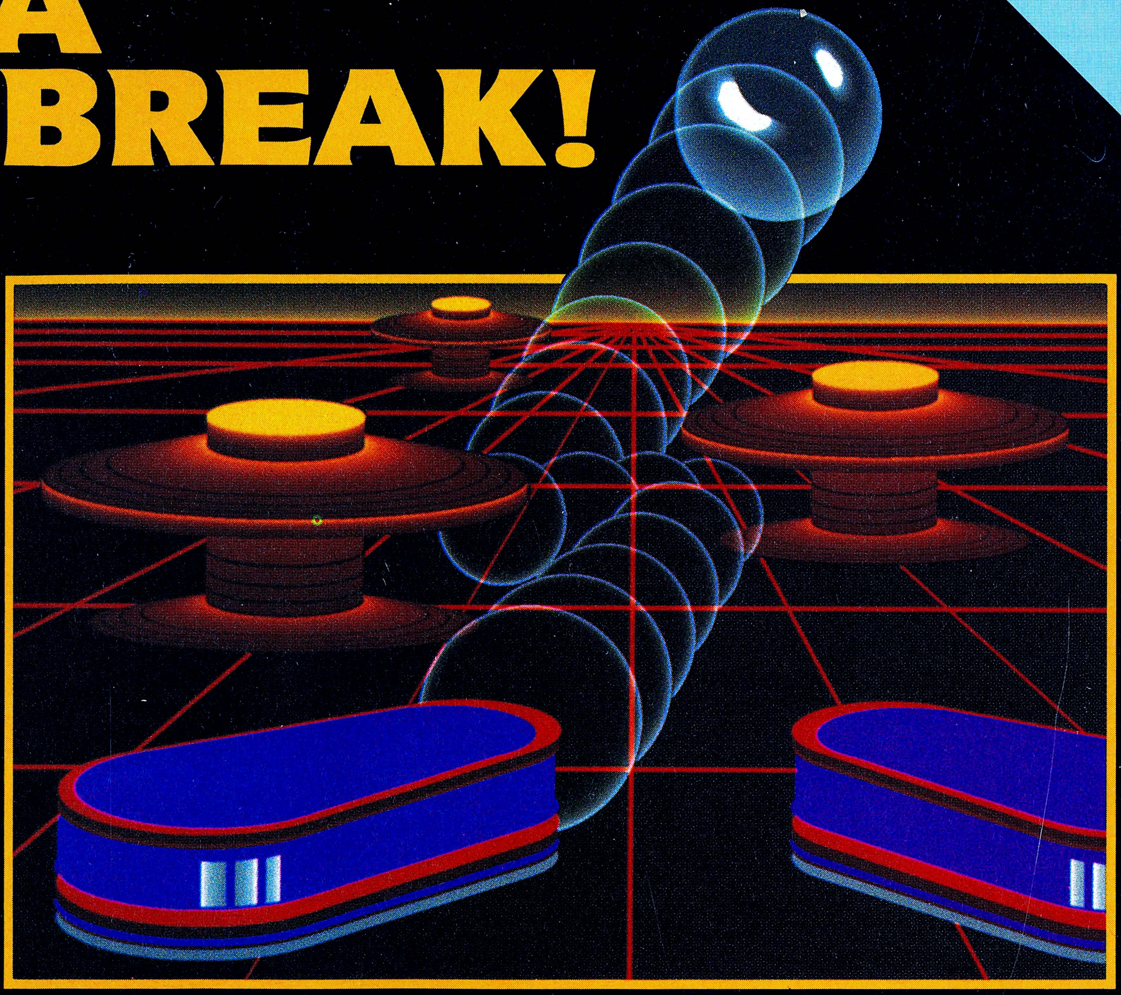

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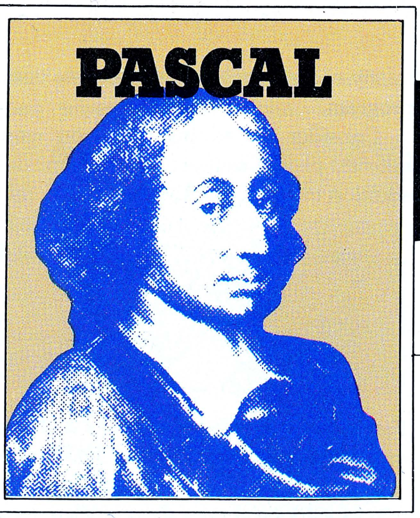

FROM BEGIN TO END

by Bruce Webster and Deirdre Wendt

Including and *Chaining*

Reader Greg Snyder, who has the Turbo Pascal compiler, has requested that we elaborate on the differences between *include* files and *chain* files. Snyder sent a whole slew of questions, but we can probably answer them all in one column.

Yes. Yes. No. No. No. Maybe. See page 12.

Just kidding, Greg.

Actually, here's what Snyder wrote: "I understand that fairly large programs can be written if the *chain* procedure is used or if files are *included*. However, I have yet to see any really specific information regarding these two procedures. I would really appreciate it if you could provide some answers to these questions in future columns."

Why *Include* and *Chain*? There comes a point in programming, as you get bolder or better, when your programs get too large to be handled as a single block—or, perhaps, too large to fit into available memory. As a partial solution to this problem, Pascal allows you to write your own functions and procedures, which you can code once and call from various points within a program. However, as your program grows, even the section that holds your functions and procedures can grow to monster proportions, limiting the clarity and manageability of your code.

Include allows you to put sections of your code into text files and then "include" such files when you compile, thereby enabling you to create programs that would be too big to edit in memory all at once. You can "include" as many files as you want. You cannot nest them, however; that is to say, you may not "include" a file that "includes" a file.

Suppose your expanding program is to perform different logical functions—enter data, correct data, search data, and print data, for example—and it looks as though each of these sections is large enough to be contained in a separate program; suppose nevertheless that you want them all to run together. In this case, what you want to do is *chain* these separate programs together.

Here's how to do both *include* and *chain.*

***Including* Files.** The *I* compiler directive allows you to divide your program into smaller sections for editing purposes. These sections of code are all pulled back together when the program is compiled. *Include* is supported by all Pascals.

The compiler directive usually follows this format:

{$I filename.ext}

Compiler directives consist of an opening bracket, either { or (*, immediately followed by a dollar sign and then a designated letter. For *include*, the designated letter is *I*. There may not be any spaces between the bracket, the dollar sign, and the letter. Following the letter: a space and the name of the file to be *included*. If your *include* file is on a different drive, be sure to indicate the drive specifier along with the filename. The whole thing, of course, ends with a closing bracket.

(Don't be confused by the *I* compiler directive that activates I/O checking. Its format is *{$I+}* to turn I/O checking on and *{$I−}* to turn I/O checking off. When the compiler sees a filename after the *I*, it knows it's to *include* the named file.)

Given that a Pascal program, in general, looks like this:

```
PROGRAM data;
  CONST
  TYPE
  VAR                     {declaration section}
  PROCEDURE
  FUNCTION

  BEGIN
     {main body of program}
  END.
```

here is one good way to use *include* files.

Create a text file (a work file) with your editor, putting all your *const*, *type*, and *var* declarations in it. For example:

```
CONST
       dislen     =    25;
       complen    =    15;
       bx         =     1;
       by         =     3;
       itemax     =     6;

TYPE
       itemrange  =    1..itemax;
       money      =    PACKED RECORD
                             dollar,cents     :   integer;
                       END;

       items      =    PACKED RECORD
                             qty         :  integer;
                             desc :  string[dislen];
                             compused : string[complen];
                             itemlist    : money;
                       END;



VAR
       filename   :    string[12];
       indx       :    integer;
       bigstring  :    string[255];
       subtotal   :    money;
```

Always give your *include* files a filename with a recognizable extension, such as .inc, so that you can easily identify them. This one you might name DtaDecl.inc.

Include files are handy to have if you plan to build a library of general-purpose functions and procedures that can be used with any program. This file, which we'll call DtaUtil.inc, would have procedures and functions such as the one below, used for inputting data. The file below prompts for a yes-or-no answer, keeps the user in a loop until he or she responds with *y* or *n*, then sets the variable *yes* to true or false.

```
FUNCTION yes(prompt:bigstring):boolean;
  VAR
    ch     :   char;
  BEGIN
    REPEAT
       gotoxy(1,1); clreol;
       write(prompt,'   (Y/N): ');
       readln(ch);
    UNTIL (ch IN ['y','Y','n','N']) and ioresult = 0;
    yes := ch in ['y','Y'];
  END;
```

You might also want to have an *include* file containing functions and procedures specific to one or a few programs. For example, here's one called DtaProc.inc:

```
PROCEDURE getitems(x,y:integer; var item:itemlist;
    itemcount:itemrange;  var sum:money);
  BEGIN
    {main body of getitems}
  END;

PROCEDURE openfile;
  BEGIN
    {main body - reset or rewrite}
  END;

PROCEDURE closefile;
  BEGIN
    {main body - close}
  END;
```

Now, using these three text files, DtaDecl.inc, DtaUtil.inc, and DtaProc.inc, you could build a Pascal program that would look like this:

```
PROGRAM data;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}

  BEGIN
     openfile;
     .
     .
     .
     IF yes('Need to get items? ') THEN
       FOR indx := 1 to itemax DO
          getitems(by,by,item,itemcount,subtotal);
     .
     .
     .
     closefile;
  END.
```

When compiling this program, the *included* files would be pulled in verbatim. For this reason, the structural integrity of a Pascal program must be maintained in each file; that is, don't include the statement

PROGRAM data;

in any of your *include* files, because you already have it in your main program.

Consider the editing time you would save if you had several different programs that used the same declarations and procedures. In addition to ⟨PROGRAM data⟩, you might have:

```
PROGRAM entrdata;                    PROGRAM prntdata;
     {$I DTADECL.INC}                     {$I DTADECL.INC}
     {$I DTAUTIL.INC}                     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}                     {$I DTAPROC.INC}
  BEGIN                                BEGIN
     {main body, entrdata}                {main body, prntdata}
  END.                                 END.
```

Remember that when you make a change to an *include* file you must recompile every program that uses it.

***Chaining* Files.** Turbo Pascal has a standard procedure that allows you to activate separately compiled programs from within other programs. The three programs of the preceding examples all use the same declarations, procedures, and functions. Nevertheless, each program has to be run separately; one could not call another. All three programs are .com files.

When *chaining*, you need to execute only one program; that program code will call the others. The master program you execute is a .com file, and the rest are .chn files. A .chn file contains program code but not the Pascal library. Before we see how a master program and some *chained* programs work together, let's look at how the three *include* files we just made would have to be modified to make them chainable.

To the declaration file, DtaDecl.inc, we'd add a file variable:

chnprg : file;

The main program, Data.com, would still initialize the data files,

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but now it would call a "chaining" program. Following is the new Data.com program and the "chaining" program, DtaLoop.chn.

```
     PROGRAM data;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
  BEGIN
    openfile;
    ASSIGN(chnprg,'DTALOOP.CHN');
    CHAIN(chnprg)
  END.


PROGRAM dtaloop;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
  BEGIN
     clrscr;
     REPEAT
       write('OPTIONS:   E>nter   P>rint   Q>uit  : ');
       readln(ch);
     UNTIL (ch IN ['E','P','Q']);
     CASE ch OF
       'E'  : ASSIGN(chnprg,'ENTRDATA.CHN');
       'P'  : ASSIGN(chnprg,'PRNTDATA.CHN');
       'Q'  : closefile;
     END;   {CASE}
     IF ch <> Q THEN
        CHAIN(chnprg)
  END.
```

The other two programs, EntrData.chn and PrntData.chn, now look like this:

```
PROGRAM entrdata;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
     {$I DTAENTR.INC}

  BEGIN
    {main body of entrdata}
    ASSIGN(chnprg,'DTALOOP.CHN);
    CHAIN(chnprg)
  END.
```

```
PROGRAM prntdata;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}

     PROCEDURE pad;
       BEGIN
         {main body of pad}
       END;

 BEGIN
   {main body of prntdata}
   ASSIGN(chnprg,'DTALOOP.CHN');
   CHAIN(chnprg);
 END.
```

The standard procedure *Chain* follows this format:

ASSIGN(file variable,filename);
CHAIN(file variable);

The best way to understand how these programs work together is to start with the .com file and work your way back and forth through the .chn files. Before we do that, there are a few things that need noticing.

Those constants, types, variables, procedures, and functions to be used in common with all four programs must be declared first and declared identically. We have met that requirement by putting all common declarations, procedures, and functions in three *include* files, which are all "included" in the same order. The task of updating your programs is made safer and easier in this manner, because all the programs using the *include* files are automatically updated with the change to that one file. This also avoids the danger that essential declarations/procedures/functions might be overlaid as *chained* programs are pulled into memory. Notice also that once the common *include* files are in place, more files can be *included* (as in EntrData.chn) and additional procedures/functions can be declared from within the program (as in PrntData.chn).

Compiling .Com and .Chn Files. Turbo Pascal allows you to compile to memory (*M*), to a .com file (*C*), or to a .chn file (*H*). Choosing the default option, compiling to memory, significantly limits the size of the program you can compile, because both the source code and object code have to be small enough to be held in memory at the same time. When you compile to a .com or .chn file, you have to worry only about

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the size of the source file. To change the default value of the compiler, select compiler *Options* from the Turbo menu. You'll get the options menu:

compile-> Memory
Com-file
cHn-file

When you select *cHn* mode, you'll get another menu from which you can set code and data segment sizes and specify the minimum and maximum memory sizes you require. You can ignore this for now; after each *cHn* file has been compiled, however, make a note of the code, data, and free status printout that comes up on the screen. When you've finished compiling all your *cHn* files, select the *Com* option to compile your main, executable program. This time when the menu appears, you must set

minimum cOde segment size: XXXX paragraphs
minimum Data segment size: XXXX paragraphs
mInimum free dynamic memory: XXXX paragraphs

to accommodate the largest segments in any *chained* program used. Choose the largest value from the information you wrote down when you compiled the *chain* files.

Everything is now set; here's how they work together.

When the master program, Data.com, is executed, it opens all the files that need to be opened (*Reset* or *Rewrite* would be in our dummy procedure, *openfile*).

ASSIGN(chnprg,'DTALOOP.CHN');

assigns a particular filename to our file variable Chnprg. It names the file to be called next.

CHAIN(chnprg);

loads into memory the file named DtaLoop.chn, whereupon execution begins.

Program DtaLoop.chn offers a set of options for processing the file(s) opened in Data.com. If "E>nter" is selected, then *CASE ch OF 'E'* assigns EntrData.chn to the file variable and *CHAIN(chnprg)* causes EntrData.chn to be pulled into memory and executed.

EntrData.chn is structured in such a way that it performs its tasks and then, with *assign* and *chain* at the end of the program, calls in DtaLoop.chn.

Again you're given a list of options regarding which program to execute next. If you select *P*, then PrntData.chn is assigned to the file variable, called into memory, and executed. PrntData.chn performs its task and then returns to DtaLoop.chn. You can continue to call up these chained programs until you select the "Q>uit" option, which calls a procedure that closes all the open files you've been working on and takes you out of the program.

Chaining programs together, using a program like DtaLoop.chn, allows you flexibility; it lets you execute programs via menu selection.

If all you needed was to have each chained program called at a set time and in a set sequence, you would not need DtaLoop.chn. You would just have each program perform its set task and then *assign* and *chain* to the next *chained* program. The first program would open all necessary files, and the last program called would close them.

For example:

```
PROGRAM data;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
  BEGIN
     {main body - open files}
     ASSIGN(chnprg,'ENTRDATA.CHN');
     CHAIN(chnprg)
  END.


PROGRAM entrdata;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
  BEGIN
     {main body}
     ASSIGN(chnprg,'PRNTDATA.CHN');
     CHAIN(chnprg)
  END.


PROGRAM prntdata;
     {$I DTADECL.INC}
     {$I DTAUTIL.INC}
     {$I DTAPROC.INC}
  BEGIN
     {main body & close files}
  END.
```

One precaution: Be careful not to set up *chained* programs in such a way that they continually call each other and leave you no way to exit.

We should mention here that there are alternatives to *chaining*. Both Turbo Pascal 2.0 and Pascal/MT+ support overlays, and the two versions of UCSD Pascal support segment procedures. But that's another story.

There you have it. *Chaining* and *including* are marvelous ways to modularize your programs, making programming neater, easier, and more enjoyable.

In Closing. In the two years that we have been writing this column, we've covered just about everything Pascal has to offer at least once. Bruce has done most of the writing, while I've done most of the advising and proofreading. We're switching roles now (it's only fair that he get to be the boss for a while), and we're going back to the beginning again. We promise not to recycle any old columns.

And, of course, we'll still take requests. ▲

Missing an installment of "Pascal B to E"? All back issues of this column— from July 1982— are still available; for further information, see page 4. The columns will also be published soon, as a single volume, from Softalk Books.

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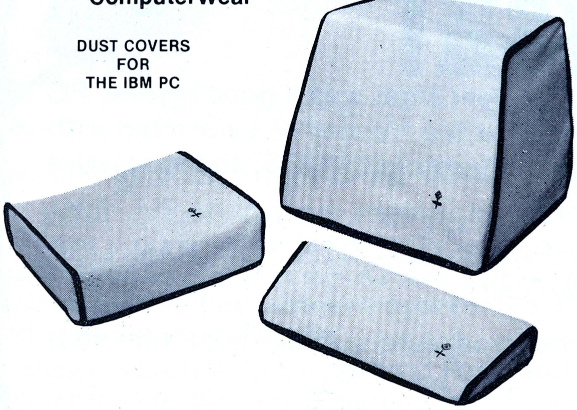

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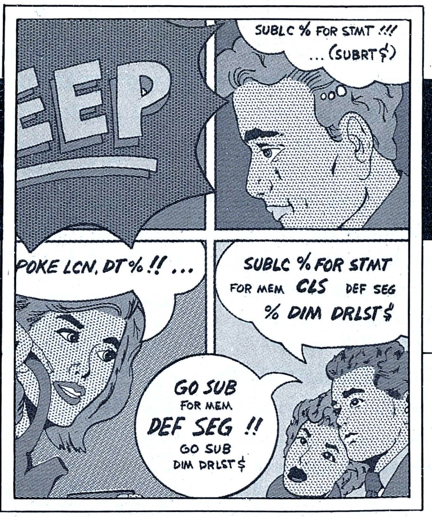
EEP
SUBLC % FOR STMT !!! ... (SUBRT$)
POKE LCN, DT % !! ...
SUBLC % FOR STMT FOR MEM CLS DEF SEG % DIM DRLST$
GO SUB FOR MEM DEF SEG !! GO SUB DIM DRLST$

BASICALLY SPEAKING

by John Dickinson

Fine-Tuning Car Care with *Restore* and Arrays

Didn't think writing a Basic program would be so much work, did you? Cheer up—the programming part gets easier as you apply what you've learned about Basic to more applications. Then, of course, the applications get harder!

If you've been following along, you should by now have a very serviceable program for computing a car's gas mileage; you may even be using this program on a daily basis. You might want to tuck the current version aside somewhere (and keep adding *data* statements for each fill-up) while you work on some more enhancements. This month's crop of changes is going to require some radical surgery.

Last time we suggested adding the car's mileage to the program's output. If you did that and displayed it as the first item on each line of the output, your program should look like this:

```
10 DATA 0
20 DATA 4
30 DATA 239, 18.3
40 DATA 537, 18.2
50 DATA 810,17.3
60 DATA 1040,14.5
1000 READ OLD.ODOMETER!
1010 READ NUM.FILLUPS%
1020 CLS : PRINT TAB(8); "Softalk Car Care Program"
1030 PRINT TAB(5); " Miles - ";" MPG ";" - PERFORMANCE -"
1040 PRINT TAB(5); STRING$(31,"=")
1050 FOR FILLUPS% = 1 TO NUM.FILLUPS%
1060      READ NEW.ODOMETER!
1070      READ GALLONS.LOADED!
1080      LET MILES.DRIVEN! = NEW.ODOMETER! - OLD.ODOMETER!
1090      LET GAS.MILEAGE! = MILES.DRIVEN! / GALLONS.LOADED!
1100      PRINT TAB(5); USING "#####"; NEW.ODOMETER!;
1110      PRINT TAB(15); USING "##.##"; GAS.MILEAGE!;
1120      IF GAS.MILEAGE! = 15.5 THEN PRINT " Standard"
          ELSE IF GAS.MILEAGE > 15.5 THEN PRINT " Above Standard"
               ELSE PRINT " Below Standard"
1130      OLD.ODOMETER! = NEW.ODOMETER!
1140 NEXT FILLUPS%
```

There are a few things you might want to notice about the Car Care program listing. We've renumbered the program from line 1000 to the end in order to even out the line numbers and make room for some new program lines. Remember, Basic doesn't care what the line numbers are as long as they're kept in the order in which you want the program to execute them. All it took to renumber the Car Care program was

renum 1000,1000

Notice also how the *tab* and *string$* functions are used to make the output evenly spaced on the screen. It usually takes a few tries to get these right, but the more you practice the easier it becomes. *Tab* and *string$* can do a lot to make your output attractive.

One last thing to note is that a portion of the program—the statements between the *for* and *next*—has been indented; we've done this because these statements form a logical section (or block) of the program. Such indentation isn't required by Basic, but it does make the program easier to read and understand. By the time you finish making this month's changes, you'll appreciate the value of indenting portions of a program.

We've been promising to show you a way to calculate a car's overall gas mileage average and use that average as a measure of standard performance (until now, we've been using a constant value of 15.5 as a performance standard). Computing overall gas mileage is nothing

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special and requires only some new lines that use techniques you're already familiar with.

All we have to do is add up the Gallons.loaded! at each fill-up and divide that sum into the total miles driven. We could compute the car's total miles by adding up each value of Miles.driven!, but it's easier to use the last value of Old.odometer!. Besides, the program will run faster that way.

Add this line to compute the new variable Tot.gallons!:

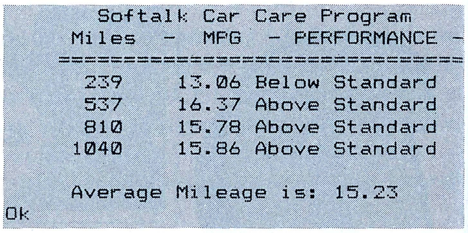
```
1072 LET TOT.GALLONS! =
     TOT.GALLONS! +
     GALLONS.LOADED!
```

Please note the line number carefully! Although you could make it any number between 1070 and 1080, using 1072 will make things easier later on.

Each time a new set of fill-up values is read, the gallons are accumulated into Tot.gallons!. Once all the fill-ups have been read, we can compute the average and report it. These three new lines ought to do the trick:

```
1150 LET AVERAGE.MILEAGE! =
     NEW.ODOMETER! / TOT.GALLONS!
1160 PRINT : PRINT TAB(5)
     "Average Mileage is: ";
1170 PRINT USING "##.##";
     AVERAGE.MILEAGE!
```

Now run the program; your average mileage will be printed out after everything else. To save space, we haven't added any new data here, but if *you* have, your program should still work fine. Our output looks like this:



```
      Softalk Car Care Program
    Miles   -   MPG   - PERFORMANCE -
   ==============================
     239      13.06 Below Standard
     537      16.37 Above Standard
     810      15.78 Above Standard
    1040      15.86 Above Standard

    Average Mileage is: 15.23
Ok
```

Good work so far, but don't pat yourself on the back just yet. There's a problem to fix.

We originally wanted to use the overall average mileage as a "standard" to replace the constant (15.5) we've been using to measure mileage performance at each fill-up. The problem is that the way we've set up the program, the average doesn't get computed until after the data for each fill-up has been loaded and the gas mileage performance has been checked and reported.

To solve the problem, we need to rearrange our Car Care program so that it computes Average.mileage! first and then checks the mileage performance of each tankful. There are several ways to do this; we'll start with the simplest one and try something more sophisticated later on.

The program is currently structured in such a way that every time the *data* statements are used they're discarded; they're never noticed again. If we could read them, compute Average.mileage! based on their data, and then read them again to compute Gas.mileage! and check the performance for each tank, our troubles would be over. Basic can't do everything, but it can reread its own *data* statements!

Data statements work a little like a tape recorder: After you've played a tape, you can rewind and play it again. Basic's rewind mechanism for *data* statements is the *restore* statement.

If a Basic program statement said

```
RESTORE
```

its entire set of *data* statements would be *restored* (or rewound). This is comparable to pressing a tape recorder's rewind button and leaving things alone until the motor stops.

If you wanted to replay only a portion of a tape, you would press the recorder's stop button before the tape had been entirely rewound. To determine when to press "stop," you would probably watch the tape counter and note when it reached the right spot on the tape.

You can do the equivalent with Basic's *restore* command. The difference is that, rather than watching a tape counter whiz by, all you

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have to do is tell BASIC where you want the *restore* command to stop. You specify the stopping point in the *restore* statement by indicating which BASIC line number contains the first *data* statement you want to read again.

For example, if you wanted to reread *data* statements starting with the one on line 30, you would say so in the following *restore* statement:

```
RESTORE 30
```

Look back at the Car Care program for a minute while we figure out how to use *restore* to restructure it (it's going to get a little tricky).

We need to change the program so that there are two *for* loops instead of just one.

The first for *loop:* The first *for* loop should read all the *data* statements—except lines 10 and 20, which contain the data for Old.odometer! and Num.fillups!. As before, the program should read those two values before it comes to any *for* loops.

Between the loops: Before the second loop starts, we need to calculate Average.mileage!. Then we have to *restore* the *data* statements, starting with the data for the first fill-up on line 30. We won't need to reread the values for Old.odometer! and Num.fillups!, so their *data* statements don't have to be *restored*.

The second for *loop:* The second *for* loop should be the same as the original one, except that it should use Average.mileage! as a standard instead of 15.5.

Whew! Read that again to be sure you understand the job at hand. It won't be hard to do if you follow each step carefully.

We can make the first loop by using the existing *for* statement on line 1050 and adding a new companion *next* statement on line 1073. The loop will read the data for each fill-up and compute Tot.gallons!.

If you do everything correctly, your first *for* loop should look like this:

```
1050 FOR FILLUPS% = 1 TO NUM.FILLUPS%
1060     READ NEW.ODOMETER!
1070     READ GALLONS.LOADED!
1072     LET TOT.GALLONS! = TOT.GALLONS! + GALLONS.LOADED!
1073 NEXT FILLUPS%
```

Don't run the program yet, unless you're interested in seeing a bunch of error messages.

The calculation of Average.mileage! has to be moved from line 1150 to line 1074. The easy way to do that is to *list* the line:

```
list 1150
1150 LET AVERAGE.MILEAGE! =
       NEW.ODOMETER! / TOT.GALLONS!
```

(You can use *edit* instead of *list* if you prefer.) Now change the line number to 1074 by typing over 1150, like this:

```
1174 LET AVERAGE.MILEAGE! =
       NEW.ODOMETER! / TOT.GALLONS!
```

Last but not least, get rid of line 1150 by typing

```
delete 1150
```

Adding a *restore* statement on line 1075 merely requires your typing it in, but be sure that you specify that the *restore* command starts at line 30. Your statement should look like this:

```
1075 RESTORE 30
```

The last big change is to make a copy of the first part of the first *for* loop. BASIC statements can be copied as easily as they can be moved; all you have to do is leave out the last step (the *delete* operation). Copy lines 1050 through 1070 to lines 1076, 1077, and 1078 by listing the lines

```
list 1050—1070
```

and typing over the original line numbers. Remember, don't delete them this time—we want to copy them, not move them.

There's just one small change left. Modify line 1120 (the one that evaluates how well our Gas.mileage! is doing) to use the Average.mileage! instead of 15.5. Making this change simply requires using some editing techniques you've already learned. You should also change the *print* statements in the *if* and *else* clauses of line 1120 to reflect the new logic of the program.

If you haven't cried Uncle! yet, your program should now look like this:

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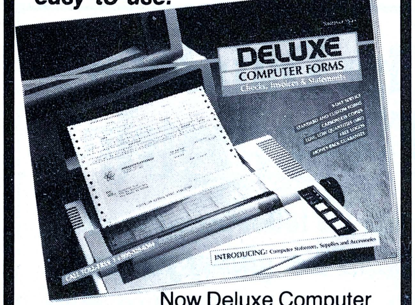

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```
10 DATA 0
20 DATA 4
30 DATA 239, 18.3
40 DATA 537, 18.2
50 DATA 810,17.3
60 DATA 1040,14.5
1000 READ OLD.ODOMETER!
1010 READ NUM.FILLUPS%
1020 CLS: PRINT TAB(8); "Softalk Car Care Program"
1030 PRINT TAB(5); " Miles - ";" MPG ";" - PERFORMANCE -"
1040 PRINT TAB(5); STRING$(31,"=")
1050 FOR FILLUPS% = 1 TO NUM.FILLUPS%
1060     READ NEW.ODOMETER!
1070     READ GALLONS.LOADED!
1072     LET TOT.GALLONS! = TOT.GALLONS! + GALLONS.LOADED!
1073 NEXT FILLUPS%
1074 LET AVERAGE.MILEAGE! = NEW.ODOMETER! / TOT.GALLONS!
1075 RESTORE 30
1076 FOR FILLUPS% = 1 TO NUM.FILLUPS%
1077     READ NEW.ODOMETER!
1078     READ GALLONS.LOADED!
1080     LET MILES.DRIVEN! = NEW.ODOMETER! - OLD.ODOMETER!
1090     LET GAS.MILEAGE! = MILES.DRIVEN! / GALLONS.LOADED!
1100     PRINT TAB(5); USING "#####"; NEW.ODOMETER!;
1110     PRINT TAB(15); USING "##.##"; GAS.MILEAGE!;
1120     IF GAS.MILEAGE! = AVERAGE.MILEAGE! THEN PRINT " Average"
           ELSE IF GAS.MILEAGE > AVERAGE.MILEAGE! THEN PRINT "
             Above Average" ELSE PRINT " Below Average"
1130     OLD.ODOMETER! = NEW.ODOMETER!
1140 NEXT FILLUPS%
1160 PRINT : PRINT TAB(5) "Average Mileage is: ";
1170 PRINT USING "##.##"; AVERAGE.MILEAGE!
```

When you run the program this time, the only change you should notice is that the report will say "Average" instead of "Standard." If the data you used for the old standard was significantly different from the computed value of Average.mileage!, the behavior of the performance report will be altered. As you add data and rerun the program, the report will vary—because the value of Average.mileage! will change with each new fill-up.

Let's pause to reflect on two small items of programming technique that will be helpful when you start writing programs longer than the Car Care program. Indenting of loops and other logical portions of a Basic program makes the program easier to read and makes its logic and structure more obvious. This point may not sound important enough to warrant repetition, but it is. In this program, for example, the fact that there are two *for* loops stands out because each loop is indented.

The other small, but important, item is that we have used the same variable, Fillups%, as a loop counter in both *for* loops. This technique also helps clarify the logic of a program. In the Car Care program, the two *for* loops perform different operations on the same group of *data* statements. The fact that they work with the same *data* statements is clarified by the use of a common loop counter. Reusing the loop counter variable also conserves memory.

The structure of the program has changed; the program should now be more useful, but the changes may have seemed more trouble than they're worth. Hang on—you're on your way to some really useful techniques. The next changes we make will give us an even more useful program, but you won't see the benefits until next month when we add more features. Sorry about that, but the changes are well worth making; in addition to their other benefits, they'll improve the program's execution speed and they'll teach you something that will keep on helping you as long as you tinker with Basic programming.

So, what's the big deal all about? *Arrays*, that's what.

What's an *array*? It's a collection of Basic variables with the same name. A *what*?

Let's begin looking at arrays by reviewing what you already know about Basic variables. The Basic variables that you're used to always have different names; such variables are called "scalar variables," and each one occupies a unique location in memory.

An array is a collection of memory locations that contains many variables of the same data type. Because each location within an array has the same name, the procedure for using array variables is slightly different from that for using scalar variables. First, before you can use array variables you have to tell Basic to make room for them in memory. Then, instead of distinguishing between them by name (as you do with scalar variables), you distinguish between them by addressing each variable's memory location using an *index*, or *pointer*. The pointer tells Basic which location within an array you're interested in.

Some pictures may help clarify this. If we had Basic scalar variables named Var1, Var2, Var3, and so on through Var20, the numbers 1, 2, 3, and so on at the end of their names would distinguish them from one another. Their arrangement in memory might look like this:

```
Memory loc.: ___1_______2_______3_____________20___
  Var. name: [ VAR1 ][ VAR2 ][ VAR3 ] . . . [ VAR20 ]
```

Using these variables would present no challenge. For example, to use them in immediate mode you might type

```
let var1 = 17
let var2 = 45
let var3 = var1 + var2
print var3
  62
Ok
```

An array uses memory in a similar way, but you have to include a pointer to identify each particular variable within your array, and hence the naming technique will be somewhat different from the one for scalar variables.

First things first, though. To set up an array in Basic, you have to ask Basic to reserve memory for it. You do that by means of a *dim* statement. *Dim* is short for "dimension" and will be easy to remember because it sets the size, or dimension, of the array. The dimension determines the capacity of the array—how many variables it may include.

If we wanted an array to contain twenty variables, we could dimension it in immediate mode like this:

```
dim var(20)
```

When it sees your *dim* statement, Basic allocates memory for your array variables. The layout of those variables in memory is similar to that of scalar variables:

```
  Memory loc.: ___1________2_______3______________20___
     Var. name: [VAR(1)][VAR(2)][VAR(3)] . . . [VAR(20)]
```

Notice the small, but important, difference between the way the variables are named in this picture and the way scalar variables are named. The variable "numbers" in the array diagram are in parentheses. That's BASIC's notation for the array pointers that identify each particular variable within the array.

Using array variables in immediate mode is really no harder than using scalar variables. All we have to do is use parentheses to surround the pointer that tells BASIC which variable in the array we want to use. The parentheses make a slight (but important) difference between this listing and the one above, but the results are the same:

```
let var(1) = 17
let var(2) = 45
let var(3) = var(1) + var(2)
print var(3)
   62
Ok
```

It would be a good idea for you to try these statements (starting with the *dim* statement) in immediate mode. You might want to make up other examples just to be sure you've got it right.

What do arrays have to do with the Car Care program? Using arrays to store variables will make it easier to add features to the program later on and will make the program faster and more compact. Sounds pretty good, but how do we do it?

For starters, add the following *dim* statement to the program:

```
5 DIM NEW.ODOMETER!(200),
  GALLONS.LOADED!(200),
  GAS.MILEAGE!(200)
```

If you need to dimension more than one array, you can use a separate *dim* statement for each, or you can gang them up in a single *dim* statement (so long as everything fits on one line). To dimension two or more arrays in one *dim* statement, just separate the array names with commas.

Why did we dimension the arrays to hold two hundred fill-ups? Well, the largest dimension an array may have is 32767, but that seemed like overkill because most cars don't last long enough to make it through that many fill-ups. Two hundred seemed enough, but if you think you need more, just make the dimension larger in your *dim* statement.

Now, change every line where New.odometer!, Gallons.loaded!, and Gas.mileage! are used by addressing the individual value you need in the array. Use the Fillup% as an array pointer. That way, each value of each array variable will be associated with a particular Fillup%. For example, line 1080 would become

```
1080 LET MILES.DRIVEN! =
     NEW.ODOMETER!(FILLUP%) -
     OLD.ODOMETER!
```

After you make the changes, run the program to be sure you get exactly the same results as before. If you don't, or if you get an error message, something's wrong.

So far, we've seen no benefit to changing to arrays, but next time we'll see a few. By loading our variable data into arrays, we eliminate the need to *restore* the *data* statements and *read* them again. That's because once the data is in the arrays, it's available for use at any time in the program. The array method will make it much easier for us to add data about oil changes and other maintenance and to analyze how well we're taking care of the car.

For starters, see if you can figure out how to use arrays to eliminate the *restore* statement on line 1075. It may seem a difficult change to make, but it's really simple. Here's a hint: All you have to do is remove three statements from the program.

See you next time—without the *restore* statement. ▲

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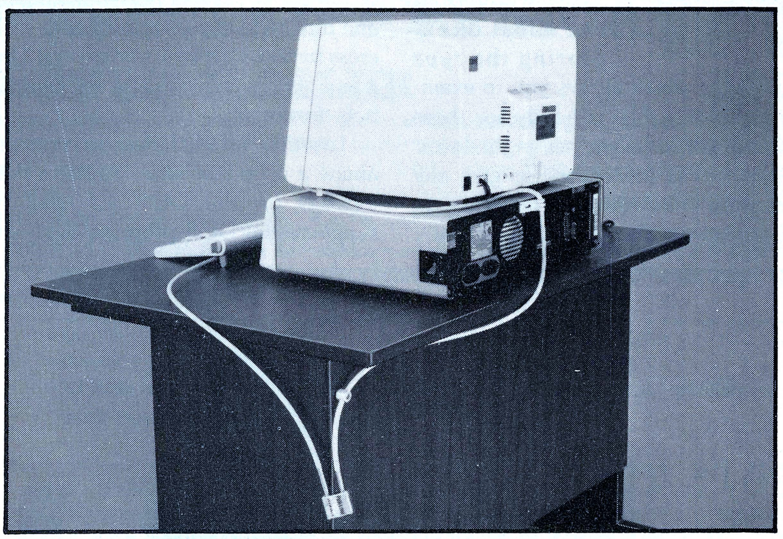

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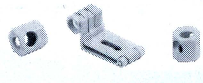

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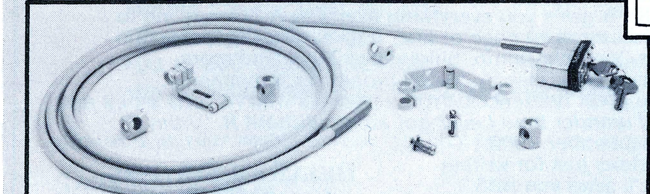

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BEGINNERS' CORNER

by Kathy Talley-Jones

ASCII; and More about the *Type* Command

When we left off in June, we were in the midst of exploring the *type* command. *Type*, which allows you to examine the contents of a file, is handy for those awkward moments when an eight-letter filename has proved too cryptic to give any clue about what a file contains. However, as we noted, sometimes the *type* command only vaguely allows us to peruse a file. Applied to certain files, *type* gives us not intelligible words and numbers, but something that looks like a cross between Serbo-Croatian and Greek with a few blackjack hands and astronomical symbols thrown in.

Last time we used the *type* command to examine a couple of files—Find.exe and Colorbar.bas on the DOS 2.1 disk and the supplemental DOS program disk—and what we got was pretty close to unintelligible. We were able to read the words "The IBM Personal Computer Colorbar" and a few other phrases and could thereby guess that we were looking at Colorbar.bas, but Find.exe left us entirely in the dark.

Why do these files—and certain others—look like so much garbage when you *type* them?

When your computer stores a word processing document, a spreadsheet model's structure and data, a graphic design such as a pie chart, or whatever, it does so by converting all the relevant human-intelligible information into computer-intelligible numbers; these numbers are what get stored in memory.

There are various ways such a conversion can be done. A programming language such as Basic, for example, has one way of doing the job; application programs that deal primarily with numbers, such as spreadsheet programs, typically each have their own method; and programs that deal mostly with text, such as word processors, do it yet another way.

Fortunately, most text-processing software follows a standard system for changing alphanumeric characters into computer-intelligible ciphers. That standard is called ASCII (pronounced ass-key).

ASCII, which stands for American Standard Code for Information Interchange, is a code by which every capital letter, lowercase letter, and punctuation mark is translated into a unique number between 0 and 127. Nearly all software that concerns itself with text—on nearly all microcomputers and many larger systems as well—recognizes and uses ASCII. It's because of the universality of this code that you can dial up remote bulletin boards or information services (that may very well run on other kinds of computers) and exchange information with them.

(The principal exception to the universality of ASCII is IBM; virtually all IBM computers

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prior to the PC employed a different text-translating code, called EBCDIC.)

In Appendix G of the IBM Basic manual, you'll find a table of the ASCII code. You'll also discover there that on the IBM PC, the ASCII code goes all the way from 0 to 255, not just to 127. That's because the PC uses an *extended* ASCII set; the upper half of this set (128 through 255) is used to encode accented characters, mathematical symbols, and some simple graphics characters.

Take a look at Appendix G, if you have a Basic manual handy. You'll see that the English alphabet goes from capital A at ASCII number 65 to lowercase z at ASCII number 122, with a few punctuation symbols strewn in between. What are the characters before 65? The characters between 122 and 127?

Some are simply numbers. That is, the characters "0" through "9" are treated by ASCII as characters just like "A" through "z" and are encoded just like ordinary alphabetic characters. (Why the ASCII code doesn't assign numbers 0 through 9 to the characters "0" through "9" isn't immediately obvious . . . but it doesn't.)

The first thirty members of the ASCII set—those characters with ASCII numbers between 0 and 31—are called control characters. These guys are the ones you create by holding down the control key and striking some other key at the same time (there are other ways to generate control characters, and not *everything* that you produce by holding down the control key and hitting another key produces an ASCII-numbered character between 0 and 31, but we won't wander into those waters just yet).

Now then, what's all this about ASCII got to do with the fun and useful *type* command? *Type* is an ASCII *decoder.* It looks at the contents of a file and converts the numbers it finds there back into human-intelligible characters—*under the assumption that the file was encoded in the first place by means of ASCII.*

Since most word processors employ ASCII to create their document files (that is to say, they create ASCII files), *type* is just dandy for displaying on-screen the chapters of your novel, your letters to the editor, and other similar data. Since Basic programs (like Colorbar.bas) are ordinarily not stored via ASCII, it's not possible to review them by means of *type*; using the *type* command to display a Basic program is a little like trying to translate a Tolstoy manuscript with the help of a Hebrew dictionary.

Basic has its own way of making numbers out of alphanumeric characters. Because its vocabulary is limited, Basic has the luxury of being able to assign a unique number (called a token) to each *word* that it understands. When you write a Basic program, words such as *print, goto, for, next,* and so on get converted to the appropriate tokens and are stored in memory in that form (in disk files, they're also stored as tokens). The token system is convenient, because it means that Basic can conserve memory (and disk space) by storing only a single number for each word instead of having to store a number for each character in each word (imagine what sort of computer we'd have to have in order to assign unique numbers to each English word).

What about material in Basic programs that lies between quote marks—as, for example, *100 print "My name is Henry"*? Obviously, Basic can't anticipate, and therefore can't tokenize, what you're going to put between quotes. For this material, Basic uses ASCII. That's why some phrases will show up on-screen in English when you apply the *type* command to a Basic program. The phrases we were able to read when we used the *type* command on the file Colorbar.bas were just those parts of the program that Basic wasn't able to reduce to tokens.

Incidentally, on the IBM PC and PC*jr* there is a way to do an end run around the token system and save an entire Basic program in ASCII. If you append a *,a* to your *save* command (the Basic manual will tell you more about how to do this), you'll get a pure ASCII file, just as you would if you wrote your program in *EasyWriter II.* And a file so saved will

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respond to the *type* command just as neatly as a word processor document will. (Basic's ASCII-save option is handy not just because it enables you to *type* your programs, but also because it allows you to import Basic programs into word processors and edit them there.)

Now, what about Find.exe? Well, that's another kettle of worms. Files with the suffix .exe or .com contain programs in machine language (that is, they're in a language that the computer can act on directly). In a sense, such programs were never intended to be read by humans (they have evolved from a form called a source program that is human-readable, but as .exe or .com files they're for machine eyes only). So, just like Basic's tokenized files, they're essentially inscrutable as far as the *type* command is concerned.

Let's see what an unadulterated ASCII file looks like. To do this, we'll create a file using one of DOS's special facilities (we won't need a word processor). Once we've made our little ASCII file, we'll read it back via the *type* command.

To create our file, we'll use the *copy* command.

Ordinarily we think of a file as something that exists on disk. DOS, however, interprets the term more broadly. DOS treats a stream of input coming from the keyboard as a special kind of file called Con: (short for *console*). If we issue the instruction

```
COPY CON: PLAYFILE.FUN
```

DOS will copy everything we type at the keyboard from that point on (until we give it an end-of-file signal) into an ordinary disk file called Playfile.fun.

So go ahead and issue that command to DOS. Because *copy* is an internal command, you don't need to have a DOS system disk in your drive when you do this. You just have to have DOS running.

Now let's type (hitting enter at the end of each line):

```
What a lark, I'm creating a file
that will appear on demand
when I use the type command.
```

Never mind the bad meter and rhyme! You'll have to type each line exactly as you want it; there's no looking back in DOS once you've hit the enter key. Just try hitting one of the arrow keys and see what happens—you can't get back up to a previous line. As you can see, DOS doesn't give you much in the way of line-editing capability. It does, however, allow you to use the backspace key to edit the line you're on.

There are two equivalent ways to tell DOS we've finished entering doggerel and ready to have it copy our file to disk. The first is to hit control-Z (that is, to hold down the control key and type the letter *z*). The second is to press F6 (on the PC*jr*, this is accomplished by pressing the function key followed by the 6 key). Either way, you are sending a control-Z character to DOS; this character is recognized by DOS as an end-of-file signal.

Now as soon as you hit enter, you'll hear the disk drive whir as the file is written on your disk. Issuing a *dir* command will show you that Playfile.fun is among your other files.

Now tell DOS to

```
TYPE PLAYFILE.FUN
```

and out will come our little bit of poetasterizing, looking just as it did when we typed it in. You can see that when DOS took the stream of characters we poured in from the keyboard, it stored the letters and punctuation as straight ASCII characters—no hearts and faces here! Now try hitting one of the cursor keys to edit one of the lines; well, you're back at the DOS prompt, and the cursor keys don't go anywhere from here. You *can* edit this file using Edlin, the line editor included on the DOS disk. Edlin is rather cryptically explained in Chapter 6 of the DOS manual. You can use it to create new files, edit old files (and save both the old file and the new version), and search for and replace text. Delve into this chapter if you want a challenge. It may even prove fun and useful.

We'll be seeing a lot more of *copy con:* in the future. ▲

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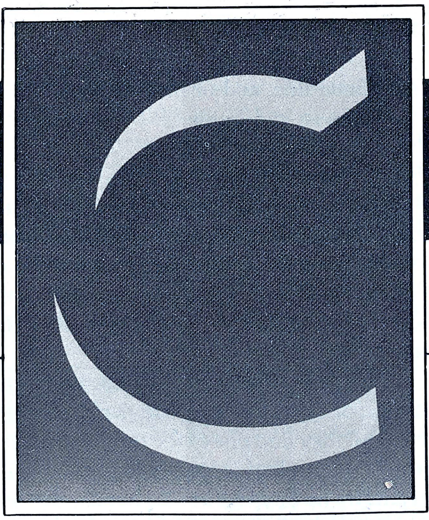


THE C SPOT

by Rex Jaeschke

Still More Pointer Pointers

Recent installments of this column have provided a basic introduction to pointers. This month we'll build on that base by writing additional useful string-handling functions and by introducing several new techniques.

```
/* --- point5.c  Variable print edit masks --- */

#define NL '\n'

main ()
{
        char *mask;

        mask = "Newline is %d decimal.%c";
        printf (mask,NL,NL);
}
```

which produces

```
Newline is 10 decimal.
```

mask = ". . ." assigns the address of the literal string to the pointer *mask*. This statement does *not* copy the string. C has no provision for handling group items such as arrays. Storage space for the string is allocated when the program is compiled. At runtime, the address of this string is stored in the pointer *mask*.

Until now, we've used only a literal string as the first argument to *printf*. We know that the compiler treats literal strings as static character arrays and that when an array is used as an argument to a function, its address, not its value, is passed. Therefore, we can use a literal string or a *char* pointer (or a *char* array name) as *printf*'s first argument. Either of these results in an address being passed. In the case of *printf*, this allows variable print masks to be used under program control, enabling the programmer to create the print mask dynamically, as appropriate to the type(s) to be displayed.

The *%d* mask causes the internal representation of the second argument (the '\n' character) to be displayed in decimal notation. The *%c* causes '\n' to be printed as a character—that is, to cause an advance to a new line.

Let's look at another simple example.

```
/* --- point6.c  Incorrect pointer use --- */

main ()
{
        char *text;

        strcpy (text,"A literal string");
        printf ("text points to '%s'\n",text);
        printf ("text points to address %u\n",text);
}
```

This produces the output

```
Text points to 'A literal string'
Text points to address 256
```

point6.c demonstrates another common source of difficulty related to pointers. The definition *char *text;* declares *text* to be a pointer to a *char*-type object. It also allocates space for storage of the variable *text*. This space will contain the address of the object that *text* points to—in this case, 256. *No* space is reserved for the object itself. *strcpy* faithfully copies the source string into the area that starts at the destination address 256; in so doing, this operation overwrites whatever was previously stored there.

text is an automatic variable. Remember that auto variables must be explicitly initialized or else they will contain garbage. Here the address that *text* points to just happens to be set to 256. This value probably will change, depending on where in memory this program is run. Our real problem is that we have no idea of or control over which part of memory is overwritten by *strcpy*. Obviously this is dangerous, and storage space should be allocated explicitly for the destination object string.

The functions *gets* (get string from standard input) and *strlen* (find length of string) usually are supplied in a compiler's runtime library. Here are source-code versions of these routines and examples of their use.

```
   /* point7.c pointer versions of gets and strlen */

   main ()
   {
         char line[80];

         printf ("Enter line: ");
         gets (line);
         printf ("\nLine is: %s\n",line);
         printf ("Line length is %d\n",strlen(line));
   }

/* gets.c - gets a string from standard input */

   #define EOL '\r'
   #define EOS '\0'
   #define EOF -1

   gets (string)
   char *string;
   {
         int c;

         while ((c = getchar()) != EOL && c != EOF)
               *string++ = c;
         *string = EOS;  /* add terminator */
   }

   /* strlen.c - returns the length of a string */

   strlen (string)
   char *string;
   {
         int length = 0;

         while (*string++)
               ++length;
         return (length);
   }
```

Example output:

```
Enter line: testing 123
Line is: testing 123
Line length is 11
```

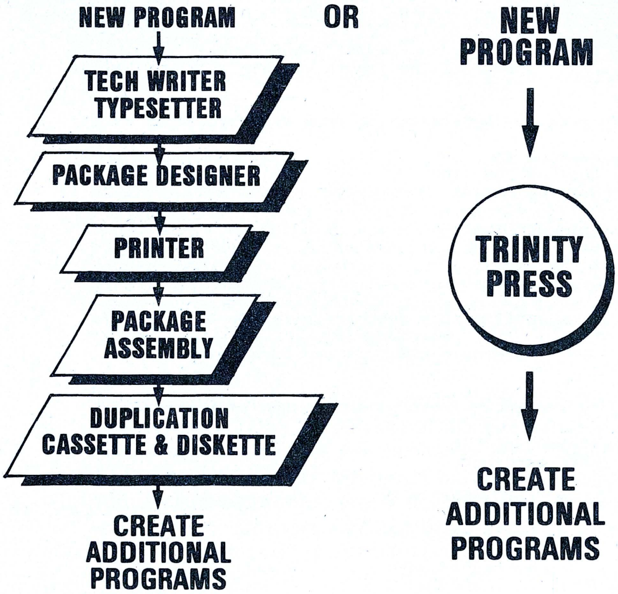
gets reads characters until it encounters either an end-of-line or end-of-file terminator. The terminating character isn't included in the string. Some implementations do include the end-of-line terminator. As we've mentioned before, it's a definite advantage to have your own source-code versions of library routines; you don't need to worry about compatibility with other compilers if you provide your own library.

Another version of *point7.c* could be

```
/* point8.c demonstrate getstr */

main ()
{
        char line[80];
        int length;

        printf ("Enter line: ");
        length = getstr (line);
        printf ("\nLine is: %s\n",line);
        printf ("Line length is %d\n",length);
}

/* getstr.c - gets a string from standard input */

#define EOL '\r'
#define EOS '\0'
#define EOF -1

getstr (string)
char *string;
{
        int c,length = 0;

        while ((c = getchar()) != EOL && c != EOF) {
                *string++ = c;
                ++length;
        }
        *string = EOS;   /* add terminator */
        return (c == EOF ? (-1 * length) : length);
}
```

Example output:

```
Enter line: go for it
Line is: go for it
Line length is 9
```



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```
Enter line: end-of-file<ctrl/z>
Line is: end-of-file
Line length is -11
```

getstr is a smarter combination of *gets* and *strlen*. It returns sensible values for all kinds of input. If the input line is terminated by a return key, the function returns the input line length. If the terminator is control-Z (end-of-file), the function returns the length as a negative number. This allows both the length and the end-of-file status to be determined.

One glaring defect of *gets* and *getstr* is their complete disregard for the size of the buffer they are reading into. They keep reading characters until they find one of the terminators. If the user enters eighty characters, the trailing *'\0'* is added, making eighty-one, and the string overflows its boundaries. To handle this situation, you must consider the maximum input buffer size. The function *getsmax,* shown below, does just this.

Functions can return variables, and a pointer is a variable. Therefore, a function can return a pointer. The following example shows just how this may be achieved.

```
/* point9.c - functions returning pointers */

main ()
{
        char line[31],*stoupper(),*stolower();

        printf ("Enter line (30 char max): ");
        getsmax (line,30);
        printf ("\nUppercase version: %s\n",stoupper(line));
        printf ("Lowercase version: %s\n",stolower(line));
}

/* stolower.c - converts all upper case
        characters in string to lower. All
        other characters remain unchanged.
        A pointer to string is returned. */

char *stolower (string)
char *string;
{
        char *str;

        str = string;   /* save string start pointer */
        while (*string = tolower (*string))
                string++; /* point to next chr */

        return (str);   /* return ptr to input string */
}

/* stoupper.c - converts all lowercase
        characters in string to upper. All
        other characters remain unchanged.
        A pointer to string is returned. */

char *stoupper (string)
char *string;
{
        char *str;

        str = string;   /* save string start pointer */
        while (*string = toupper (*string))
                string++; /* point to next chr */

        return (str);   /* return ptr to input string */
}
```

Output might look like this:

```
Enter line (30 char max): UPPER and lower
Uppercase version: UPPER AND LOWER
Lowercase version: upper and lower
```

The statement *char *stoupper(),*stolower() ;* declares that the functions *stoupper* and *stolower* return pointers to *char* objects. *char *stolower (string)* and *char *stoupper (string)* are the actual entry points for these functions. It isn't obvious at a glance that, because of the *char ** prefix, this is where these functions begin. To avoid errors it is necessary that the calling and called functions match in their declaration of any returned values. If *main* and each called function were compiled separately, a mismatch in return-value type would go undetected by the compiler. If all three functions are in the same source file, however, the compiler would report any such mismatch.

Remember that functions, by default, return (or expect) *int*-type values. Don't treat returned pointers as type *int*. We've already mentioned the dangers inherent in this practice. *stoupper* converts any lowercase characters in a string to their uppercase equivalents. The only argument needed is a pointer to the string to be converted, so what's all this need for returning pointers? Both of these case conversions could be written more simply by omitting all reference to returned values. However, by providing the capability of returning pointers, we've added some utility. Let's assume that we did not return a pointer to the converted string. To convert and print a string we would need

```
stoupper (string);
printf ("Upper case version: %s\n",string);
```

If a pointer to the converted string is returned, this can be accomplished with a single statement:

```
printf ("Upper case version: %s\n",stoupper(string));
```

You might argue that the first version is more readable in any case. Maybe so, but experienced C programmers usually prefer the latter, more terse, version, because (they say), "That's what C is all about." Of course, even if a pointer is returned, you can still use the first version. If you do, the returned value is just ignored. Whether or not the returned value is used, you should still declare the called function to return a pointer, because it's possible that later on you may add code to process that returned value and forget to add the declaration, thus causing a default to type *int*.

Sometimes it's useful to add one string to the end of another. *strcat* is a commonly supplied library function that concatenates strings.

```
/* point10.c - concatenating strings */

 char string1[21] = "Prefix";

main ()
{
      char string2[11],*strcat();

      printf ("Old string1 is: %s\n",string1);
      printf ("Length of string1 is %d\n",strlen(string1));
      printf ("Enter string2 (10 char max): ");
      getsmax (string2,10);
      printf ("\nNew string1 is:

%s\n",strcat(string1,string2));
      printf ("Length of string1 is now %d\n",strlen(string1));
}

/* strcat.c - concatenate two strings returning
      a pointer to the destination string */

char *strcat (string1,string2)
char *string1,*string2;
{
      char *ptr = string1;

      while (*string1) /* position at null */
            ++string1;
      while (*string1++ = *string2++)
            ;
      return (ptr);
}
```

Here's how the output might look:

```
Old string1 is: Prefix
Length of string1 is 6
Enter string2 (10 char max): Saturday
New string1 is: PrefixSaturday
Length of string1 is now 14
```

char string1[21] = "Prefix"; causes the static *char* array *string1* to be created with twenty-one character elements. The first seven *chars* of

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string1 are initialized to *P r e f i x \ 0*. The first *while* loop in *strcat* is used to skip through the *chars* of *string1*, stopping at the terminating null. Then characters are copied from *string2* to the end of *string1*. Obviously, *string1* must be dimensioned large enough to handle the strings' combined lengths, plus the null terminator. The terminating null of the original version of *string1* must be overwritten by the first *char* copied from *string2*; otherwise, *string1* would have an embedded null char. This null would incorrectly indicate end-of-string.

```
/* point11.c - comparing strings */

main ()
{
        char string1[21],string2[21];

        printf ("\nEnter string1 (20 char max): ");
        getsmax (string1,20);
        printf ("\nEnter string2 (20 char max): ");
        getsmax (string2,20);
        printf ("\nComparison is %d\n",strcmp (string1,string2));
}

/* strcmp - string comparison function
        return  0 if string1 = string2
                1 if string1 < string2
               -1 if string1 > string2 */

strcmp (string1,string2)
char *string1,*string2;
{
        while (*string1 == *string2) {
                if (!*string1)
                        return (0);
                ++string1;
                ++string2;
        }
        if (*string1 < *string2)
                return (-1);
        else
                return (1);
}
```

This produces

```
Enter string1 (20 char max): abc
Enter string2 (20 char max): abc
Comparison is 0

Enter string1 (20 char max): abc
Enter string2 (20 char max): abcd
Comparison is -1

Enter string1 (20 char max): ab
Enter string2 (20 char max): ABC
Comparison is 1
```

strcpy compares the two strings one character at a time. In the first example, the strings both contain *a b c \ 0*. All four *chars* are compared and found equal. In this case, one of the characters must be checked for the terminating null so we'll know when we've reached the end of the strings. This check is done using

```
        if (!*string1)
                return (0);
```

which is a shorthand notation for

```
        if (*string1 == '\0')
                return (0);
```

Beware. Some library versions of *strcmp* may use a negative number other than −1 to indicate "less than." Likewise, they may return a positive number other than 1 for "greater than." For this reason, it's best not to test explicitly for these values but rather to test for ⟨0 or ⟩0.

In our next installment, we'll continue our discussion of pointers and serve up some more advanced examples. ▲

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BY NELSON FORD

As critics of Basic love to point out, Basic is slow at some tasks, even when compiled, and it cannot perform some functions at all using its standard commands. Fortunately for Basic aficionados, assembly language routines to fill in the gaps and speed things up abound in the public domain. With these you have all the advantages—the development facilities of Basic and the power and execution speed of assembler.

Here's a listing of some of these routines and the tricks they'll perform. Each of these is a machine language subroutine that can be called from Basic.

Scroll.bld—allows you to scroll all or part of the screen up or down. This routine first appeared in the February 1983 "Questions and Answers" column in *Softalk*. Amazing that such a nifty and useful piece of code was just tossed into an answer to a reader's question. A month or two later, Will Fastie devoted his entire column in *Creative Computing* to his efforts to develop an almost identical routine. Lee Buck of Arlington, Virginia, wrote a Basic program to demonstrate the use of this routine in March 1983, although he does not credit Nancy Andrews. It frequently happens that several people write similar programs at about the same time.

QPrint.bin—allows you to write to the screen approximately ten times faster than you can using *print*. This routine is published and described by Dan Rollins in the July 1983 issue of *Byte*.

QClear.bin—is patterned after *QPrint*, but its purpose is to quickly clear from the cursor position to the end of the line or to the end of the screen. Old Radio Shack programmers will recognize this as the equivalent of RS's *print chr$(30)* or *print chr$(31)*.

Basparm—allows you to pass parameters to a compiled Basic program from DOS. For example, when you run *Readbas*, you're asked to enter a program name and output device. Adding the *Basparm* routine to *Readbas* would allow you to enter those parameters at the time you call *Readbas* from DOS. This routine appeared in *PC World*'s "*.*" column in November 1983.

Bastodos.bas—Not long after DOS 2.0 arrived, James P. Morgan, author of *Basicaid*, contributed *Bastodos* to the public domain. Every serious Basic programmer should have this program. In it, Morgan provides a separate routine for each of the new DOS 2.0 function calls. Each routine contains all the assembly language code for the function as well as the Basic code for calling and using it. The subroutines in *Bastodos* can read a disk directory or search for a filename, return the amount of free space on a disk, tell you if a disk is single- or double-sided and what DOS version you are using, allow you to change the default drive, deactivate and reactivate the control-break function, change file attributes, and perform many other functions. Like *Basicaid*, this is a very well commented program.

Structured Basic Programming Aids. Here are a couple of other handy tools for the Basic programmer:

LBas.exe—lets you write Basic programs with a text editor, using labels instead of line numbers as targets for *gosubs* and *gotos*. When you're ready to compile, you first run *LBas*, and it replaces the labels you used with the line numbers that the compiler requires. *LBas* is written in assembler, so it runs quickly. Call it from the same batch file that you use to compile your programs and you'll hardly notice the extra step. *LBas* was written by Jack Botner. The January 1984 issue of the *Programmer's Journal* contains an article—on structured programming without line numbers—that goes well with *LBas*.

B-Simple.bas—is a Basic program by Ira Glickstein that guides you in adding your program code to it. When finished, you can delete the part of the program that was guiding you, leaving your own code in a nicely structured format.

The Contest Is Over. Dozens of people suggested the name *shareware* for the genre of pay-if-you-like-it software. But, as reported here last month, that name is already in use, by Quicksoft, purveyor of *PC-Write*. Quicksoft, however, informs us that the name *shareware* was originated by a columnist at *InfoWorld* who told them (Quicksoft) that the name could be used by anyone. Although some of the other two or three hundred names suggested are more original, accurate, or amusing (*Under-ware*? Really, Virginia), *shareware* has the advantage of already being widely used and recognized.

Since *shareware* is not an original name, the big grand prize of a free disk of PD software will be awarded to ten people selected at random from all those who submitted names. The "wide-spread fame" goes to *InfoWorld*'s Jay Lucas, who came up with *shareware* in the first place.

The rest of this month's column will be devoted to a few nifty *shareware* programs that you may or may not know about. Most of the authors of these programs will provide you with a trial copy if you send a formatted disk and a postage-paid self-addressed mailer.

PC-Musician. Music on the PC has never been popular because of the PC's limited sound capability and because of the machine's business orientation. (While you might be able to sneak in a game of *PC-Man* at the office undetected, it's a little less likely that the *William Tell* Overture will go unnoticed.) The "Public Library" has a disk of various musical pieces that has generated almost no demand.

Into this unfriendly environment comes *PC-Musician*, a very friendly music composition program written by Christopher Wiley. Using the function keys, you select the type of note (whole, half, quarter, or whatever) and specify other parameters (sharps, flats, naturals, dots, and so on). Then you use the cursor keys to place notes on the staff. If you have graphics, your notes appear on-screen just as they would look on paper; on the monochrome monitor, you get happy faces and other ASCII symbols.

Pressing the space bar lets you sound a note before you select it; and you can stop and play all or part of what you've already composed. It's too bad that the PC's limited musical aptitude prevents it from fulfilling the potential of *PC-Musician*, but this program makes the most of what capability the PC does have. (*PC-Musician*, by Christopher Wiley, Box 111, VAMC, Prescott, AZ 86313. $20.)

***AXX* and *File Manager*.** Several people have sent in copies of a program called *AXX*, a file manager. This appears to be an outstanding program, but it has no documentation. There's also an interesting item called *File Manager* that looks and works like the Lotus *1-2-3* File Manager module; unfortunately, this one too has neither documentation nor any indication of authorship. If anyone knows for sure that these are public domain programs, please pass that info along.

***Picture Graphics* (*PCPG*).** Anyone remotely interested in graphics will want to check out this disk. *PCPG*, written by Eugene Ying, lets you draw on the screen with a digitizer, a joystick, or the cursor keys. It will send your pictures to a printer or a plotter, and it will let you create a "slide show" on the screen.

Drawing lines, circles, and boxes is easy with *PCPG*, but even if you are one of those who can't draw water, there's still hope: *PCPG* comes with about 250 menu-selectable pictures on disk. When a picture appears on the screen, you can change its size or color, flip it, move it around, and paint it. Then you can go back to the menu and select another picture to add to the first one, or you can add freehand drawings or text.

Five text fonts, including a beautiful Old English, are available. In a matter of minutes you can create a customized sign with fancy print and excellent graphics. If you send in for *PCPG*, save yourself a second postage stamp and send the $20 when you write for the disk; you're going to want to do that anyway, as soon as you try out the program. (*Picture Graphics*, by Eugene Ying, Box 549, Kingsbridge Station, NY 10463. $20.)

***Remote Bulletin Board System* (*RBBS*).** *RBBS* is a popular program allowing you to set up your own bulletin board. You can do this with as little hardware as a two-drive PC, a modem, and your home phone line, but most serious system operators (sysops) use hard disks and separate phone lines. If you aren't interested in starting a public BBS, you might still find uses for this software—such as calling your office computer from home or setting up a private BBS for your company or user group.

***PC-Golf*.** This program, by Ed Chandler, lets you enter information about several golf courses that you play and record your scores by hole for those courses. Once you have accumulated such a history, *PC-Golf* helps you analyze your play.

***LETUS A-B-C*.** The *Literature Evaluation Table User Service* (*LETUS*), by R. Nelson, is a huge catalog of magazine articles, columns, and even letters to the editors, drawn from *Softalk*, *Personal Computer Age*, *PC* magazine, *PC World*, and *PC Tech Journal*. It also includes PC-related items in *Byte*. The database, organized by magazine and including material published since January 1982, comes on three double-sided disks of files that can be read by *PC-File*. You can search by subject, author, or title.

LETUS is much easier to use if you have a hard disk. You can combine the files into one large (830K) database, using the *PC-File combine* utility. If you don't have a hard disk, you have to swap out disks and change files to do a search of all the magazines for a single subject. (*LETUS A-B-C*, by R. Nelson, 3790 El Camino Real, Suite 2006, Palo Alto, CA 94306. $40. Send three disks and $10 to try.)

***Epistat 3.0*.** *Epistat* is a set of statistical programs by Tracy L. Gustafson, M.D. The disk directory looks like the index of a statistics textbook. There are twenty-six programs, ranging from Anova (analysis of variance) to Student's T-test. (*Epistat*, by Tracy L. Gustafson, M.D., 1705 Gattis School Road, Round Rock, TX 78664. $25.)

***FX Setup*.** This is a utility by William J. Burlingame that makes the Epson FX printer series easier to use. With it, you can easily select a combination of printer options, download the upper 127 ASCII symbols to your printer, or design and download your own character set. Burlingame asks $35 for this utility, which seems a little high; but, as always, you can try it out for free and send whatever you think it's worth. (*FX Setup*, by William J. Burlingame, 1004 Westmoreland Avenue, Huntsville, AL 35801. $35.)

More, More, More. These are by no means all of the *shareware* programs available. More come in all the time; we'll describe as many as possible in future columns. In the meantime, keep those cards, letters, and disks coming, but please include a self-addressed stamped envelope when requesting information. Many people write to ask where to get programs mentioned in "The Public Library." One of the goals of this department is to encourage people to get more involved with their local user groups and bulletin boards; these organizations should have the programs in their own libraries (if they don't, *they* should be writing me). If you're unable to find a particular program through these channels, you can send a double-sided formatted disk and a postage-paid mailer, plus $2, to Nelson Ford, Box 61565, Houston, TX 77208. ▲

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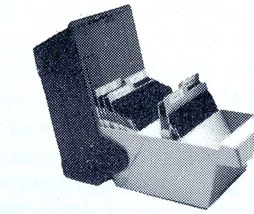

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THE PATCH PATCH

WordStar Tab Tips

Mr. Rich French writes in the April 1984 *Softalk* (see "Crosstalk") that he creates his assembler code in *WordStar*'s document mode and then cleans it up with the Clean utility because he detests tab characters in his program files—he prefers space characters. I feel the same way about tab characters but have found a much easier way to avoid them in those files that must be in pure ASCII.

In *WordStar*, setting the Vari-Tabs feature determines whether the tab key will insert tabs (09H) in the file or spaces (20H), *regardless* of whether you are in document or nondocument mode. If Vari-Tabs is on, then the "!" characters in the ruler line set the tab stops, and spaces are entered into the file. If Vari-Tabs is off, then the tab stops are fixed and tab characters are put into the file.

The default Vari-Tabs setting for document mode is on; for nondocument mode it's off. Also, in nondocument mode the ruler line isn't displayed. These settings are easily changed. When I start a nondocument edit, I use control-OV to toggle Vari-Tabs on, and control-OT to display the ruler line (I have *ProKey* do all this for me). Once that's done, I can produce a clean ASCII file with spaces rather than tab characters, and I avoid having to run it through a cleanup program. Another advantage of these settings is that I can put the tab stops where I want them, creating them with control-OI and eradicating them with control-ON, or by creating my own ruler line.

You can easily test this by starting a file in nondocument mode in the Vari-Tabs-off default mode and using the tab key a few times while typing a short paragraph. Then toggle Vari-Tabs on, start a new paragraph, and type a few lines again using the tab key. Save the file to disk and look at its contents with Debug or with Norton's *Disklook*. You'll find 09H characters in the first paragraph and 20Hs in the second.

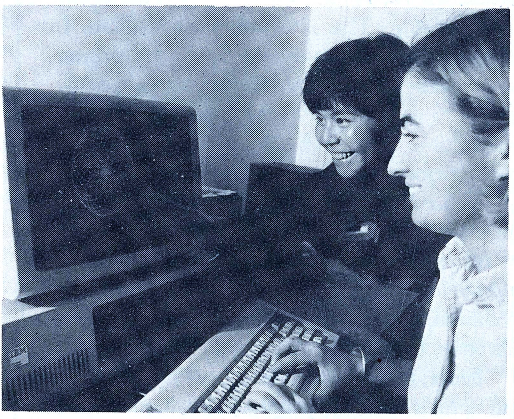
CLEAN
UTILITY

Note that Vari-Tabs is a *toggle*. Control-OV changes the Vari-Tabs status every time it's pressed. The same applies to the ruler line display and control-OT. Therefore, if you resume rather than start an edit, check the status of these toggles in the control-O on-screen menu before you change anything.

John R. Herzfeld, Mercer Island, WA

A Pascal Compiler Fix

Here's a patch for the IBM Pascal Compiler, version 1.00. An error occurs in PCs that have at least 512K of memory. The error, which causes the compiler to indicate that it's out of memory, is due to the incorrect usage of a signed compare (JLE MEMA) instead of an unsigned compare (JBE MEMA) in line 18 of the procedure BEGXQQ in the file Entx6s.asm on one of the Pascal distribution disks. You should fix existing Pascal programs by relinking with the patched Pascal.lib.



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Make a copy each of the files Pas1.exe, Pas2.exe, and Pascal.lib, giving each file an extension of .dat. *Don't* patch the original files.

Enter the following Debug commands:

Debug

(Place the disk containing Pas1.dat into drive A).

```
-N A:PAS1.DAT
-L
-E CS:72A 76
-W
```

(When disk activity is finished, place the disk containing Pas2.dat into drive A and continue).

```
-N A:PAS2.DAT
-L
-E CS:112A 76
-W
```

(When disk activity ceases, place the disk containing Pascal.dat into drive A and continue).

```
-N A:PASCAL.DAT
-L
-E CS:58A 76
-W
-Q
```

Rename Pas1.dat, Pas2.dat, and Pascal.dat to Pas1.exe, Pas2.exe, and Pascal.lib respectively.

David Taylor, Weatherford, OK

Scrnsave Selector

I use this batch file as my Autoexec to get around the incompatibility between John Socha's *Scrnsave* program ("Socha's Toolbox," December 1983) and *Smartcom II* (Hayes Microcomputer Products). The batch file uses the program Errlev.com (written by Gerald Crichton of La Canada, California, and published in the May 1984 *PC World*) to convey a message that requires a single character of input (in this case Y or N) and sets an exit code matching the input character's ASCII value. This allows you to choose whether or not to run *Scrnsave* with *Smartcom* (or any other program). To turn *Scrnsave* on or off again, you have to reboot.

```
:SCREENSV
ECHO ON
REM
REM     Do You Want Screensave ON? (Y or N)
ECHO OFF
ERRLEV
IF ERRORLEVEL 90 GOTO SCREENSV
IF ERRORLEVEL 89 GOTO SCRNYES
IF ERRORLEVEL 79 GOTO SCREENSV
IF ERRORLEVEL 78 GOTO SCRNNO
GOTO SCREENSV
:SCRNYES
SCRNSAVE
ECHO ON
REM     Screensave is ON
PAUSE
ECHO OFF
GOTO CONT
:SCRNNO
ECHO ON
REM     Screensave is OFF
ECHO OFF
:CONT
```

Luiz C.P. Gastal, San Francisco, CA ▲

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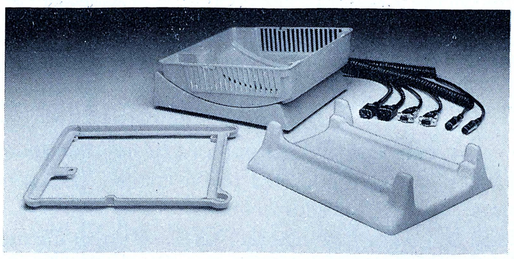

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MARKETALK REVIEWS

Databurst

If you're tired of coding the display screens used in your Basic programs or of painstakingly setting up input fields and their corresponding screen attributes, you'll find *Databurst*, a system for screen and keyboard control, a welcome alternative. Now you can spend your time concentrating on program logic instead of on routines to handle the screen and keyboard. In most cases, it's not much fun designing such routines and even less so testing them.

Databurst starts by letting you design screen formats quickly, with specifications about which fields are input and which are output. After you've created these screen formats and stored them on disk, the program sets up the necessary linkage within a Basic program so it can use the screens you've created. Let's see exactly how all this works.

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The first item on *Databurst*'s opening menu is *Create/Update Screen Source File*. This option lets you design a screen layout by giving you an empty screen and having you move the cursor to set the fields where you want them. You can design and store for use up to sixteen screens in a single Basic program.

During the screen-design stage, you can copy and move lines on the screen. The predefined alt keys are another nice feature—they automatically display the symbols most often used for creating boxes around text on the screen.

All forty function keys can be defined and used by your program, and *Databurst* will return information about their status. Additionally, most of the keys can be programmed to work with the alt key.

Once you've formatted the screens, the program will ask about each field you've defined. At this time, screen attributes, field formatting, and the like are accumulated for each field. When everything has been defined, the information is saved on disk. The file so created is known as the screen-source file. The menu's second option is *Generate a Screen Format File*. This compiles the information in the screen-source file into a format usable by the runtime module that will later interface with your Basic program. This file also is stored on disk.

Option 3, *Display Screen Format*, allows you to test each format you design with actual key-entry values. This helps you debug before the Basic program (that will use the screens) enters the picture.

Once a screen format has been generated, you can write the Basic program that uses the screen. Actually, however, you only have to write part of this program. The fourth option on *Databurst*'s menu is *Generate BASIC Program*. At this point, an initial Basic program, based on all the screen-format files you have specified, is written by *Databurst*. This file includes all the necessary calls to read or write from the screens you've just built and handles keyboard input. All you have to do is modify the Basic program it generates to make it handle the data read and displayed as you desire (accumulate totals, compare logic, and so on), and your program is ready for testing.

The final step before you leave the *Databurst* menu is to select option 5, *Generate a Runtime Screen Handler*. This module takes care of the initial screen-loading and keyboard functions, and it can be loaded wherever it most efficiently uses available memory.

The preliminaries involved in creating the screens and the runtime module are a bit involved and are definitely for programmers who have a good working knowledge of Basic. The program's manual, however, makes learning much easier. Once you've mastered the program and put it to full use, its benefits will be immediately recognizable.

Operating *Databurst* requires first that your Basic program be pointed at the runtime module (by means of a *def seg* statement); then the screen handler needs to be called and passed the variables that are to be displayed (or, in the case of reading data from the screen, the variables in which the values of the screen fields will be returned). All this has been taken care of, smoothly and efficiently, by the option that generates the Basic program, although the manual supplies information to help you do it yourself, should you be so inclined.

Error situations are handled well, both during the "building" stage and while the Basic program is running. After each call to the runtime handler, you can check return codes to make sure the desired function has been performed correctly. The manual lists all the error codes and messages you might encounter, along with the appropriate remedies.

There appears to be one functional problem with *Databurst*. If you type too many characters into a field (say, if you define a field to be fifteen characters long and erroneously type twenty into it), the cursor jumps to the start of the next field and displays the excess characters therein, without giving any indication that an error has occurred. It would be better if an option were available to handle this type of error. For example, when the maximum for a field is reached, the speaker could beep and the keyboard could lock up.

The program is not copy-protected, and it will work with either a monochrome or a color display, but only in eighty-column mode. Compiled Basic programs are supported by an

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Inside Outside

to yourself to check out the Qubie' 212A modems.

Just a few years ago, computers needed big air-conditioned rooms to operate in, balefuls of money to buy, and a team of wizards to keep them running. The constant march of technological progress has given more and more powerful machines which cost less and less. Desktop computers more powerful than the early mainframe computers are the result of the evolution. The Qubie' modems represent the latest extension of this progress. Because up until now, a 212A compatible modem cost at least $500. Through the use of four low-cost, state of the art microprocessors, we can now offer two versions of our full featured 212A modem at prices the competition sells 300 baud modems for.

In The Beginning

In September of 1983 we introduced the first 212A modem card for the IBM PC available for under $300. The PC212A/1200 is a complete communications package including PC-TALK III software, modular phone cable, card edge guide, and instruction manual. The modem is an auto-dial, auto-answer type, which uses all the Hayes software commands so it can be used with any of the popular software packages including Crosstalk™ and Smartcom™ We picked the best software package we could find based on it's ease of use and features, PC-TALK III. Our modem includes features the old industry standard missed out on. Like being able to fit in one slot in a Portable PC or PC/XT. Or an optional connector to use the modem's serial port when not using the modem. Of course the topper is the $299 price, hundreds less than the competition.

Now Available Outside

Our standalone modem, the 212E/1200 can be used with any computer or terminal with a RS-232C serial port. You can use any Hayes compatible communications software on anything from an Apple to a Zenith. Many owners of IBM PC's are using it because they lack available expansion slots, or have more than one computer they want to use their modem with.

It's attractive gold anodized case houses seven status lights (who says low prices means a shortage of features). It fits comfortably under a standard telephone. It is also a 212A compatible auto-dial, auto-answer modem which supports all Hayes software commands. Even the switch settings are the same, so any software giving recommended switch settings for a Hayes modem can be used, without knowing what the switches do. There is a volume control knob for easy adjustment of the speaker's output. Included in the package is modular phone cable, a cable to hook it to your computer or terminal, and instruction manual. Choose the communications package right for your needs, and you're ready to go!

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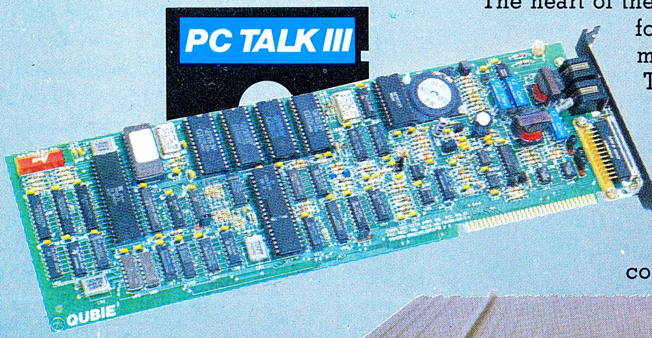
The heart of the Qubie' modems are four digital signal microprocessors. Two handle sending, and two do the receiving. Rather than attempt to filter all but the relevant tones used for modem communications, the microprocessors measure the tones digitally. This allows them to overcome line noise and static better than analog filter based modems



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additional package that is available at extra cost.

For those who would like to preview *Databurst* before deciding whether to buy, a demonstration package is available; the full price of the demo may be applied toward the purchase price.

—*Howard Glosser*

Databurst, Key Solutions (Box 2297, Santa Clara, CA 95505; 408-554-6125). Requires 128K. $225. Runtime support for compiled BASIC, $40. *Databurst* demonstration package, $45.

FilePath

Have you ever wondered why the DOS 2 *path* command works on .com, .exe, and .bat but not on data and text files? It hardly seems fair.

SDA has done something about it. Their *FilePath* does for text and data files what *path* does for program files.

FilePath makes the examples used for tree-structured directories in the DOS manuals come to life. With *FilePath*, the word processor you have stored in your Wordproc directory will happily work on files in your Memo, Letters, or Reports subdirectories without making you leave the program and change the current directory. If a program you use in several directories requires standard data files (such as *Personal Editor*'s Profile and Help files), you won't have to keep a copy of these files in each subdirectory in order to use them.

FilePath requires DOS 2.0 or 2.1 and works with either floppy or Winchester disks. Its syntax looks exactly like that of the *path* command, but SDA has added a few enhancements. Because it's separate from the *path* command, *FilePath* defines a path for data that may be different from or exactly like (as you choose) the one you've defined for programs (via *path*). For example, if you wanted to use data files and programs in the DOSres directory on your C drive, you would have to issue two commands:

```
path C:\DOSRES
```

and

```
FP C:\DOSRES
```

FP is the abbreviation you use to run *FilePath*. If you wanted to work with data in a different directory, say Wordproc, you would issue this version of *FilePath*:

```
FP C:\WORDPROC
```

which won't affect the regular program *path*. You could also have *FilePath* leave a trail for data in both directories, like this:

```
FP C:\WORDPROC;C:\DOSRES
```

The search order for *FilePath* is exactly like that for *path*. The first directory on the *FilePath* is the first one checked after the current directory; the second one is checked next, and so on.

FilePath adds a few twists to standard *path* syntax. You can use wildcards (* and ?) in directory names, and you can define a *FilePath* to be a whole tree of subdirectories. If you had a word processing directory with these subdirectories:

```
WORDPROC
  MEMOS.DEP
  MEMOS.ADM
  LETTERS
  MAIL
```

and you wanted to define a *FilePath* for all Memos subdirectories, you could use

```
FP WORDPROC\MEMOS.*\
```

If you wanted to use all subdirectories beginning with the letter *M*, you could use

```
FP WORDPROC\M*.*\
```

Question-mark wildcards can be used similarly. The *tree* option allows you to define the whole Wordproc directory as a *FilePath*, like this:

```
FP WORDPROC\/T
```

The */T* is *FilePath*'s syntax for the option. Using a slash to define options should be familiar if you've worked with options in regular DOS commands. You'll need to make one slight adjustment, though: You'll have to use the trailing backslash for directory names if you're using *FilePath* syntax extensions (*path* and *FilePath* allow you to leave it out in most circumstances).

The behavior of some programs and DOS commands will change when you use *FilePath*. For example, the *exist* command used in batch program *if* statements will look along the *FilePath* for a file, so some of your batch programs may have to be changed. *Copy*, on the other hand, doesn't follow the *FilePath*, so it works exactly as it always has.

SDA's documentation points out that most programs will save a modified file in the current directory even if it was accessed from another directory by way of *FilePath*. For the most part this information is accurate, but at least one program we used with the product stored modified files back in the directory they came from. Experiment before going too far with *FilePath*; it will do just what you want it to most of the time, but be careful when first using it and when trying it out with a new program.

Most programs work with *FilePath* (and programs that are overlaid will even pick up their code modules along the *FilePath*), but there are some notable exceptions. SDA staffers found, for example, that Ashton-Tate's

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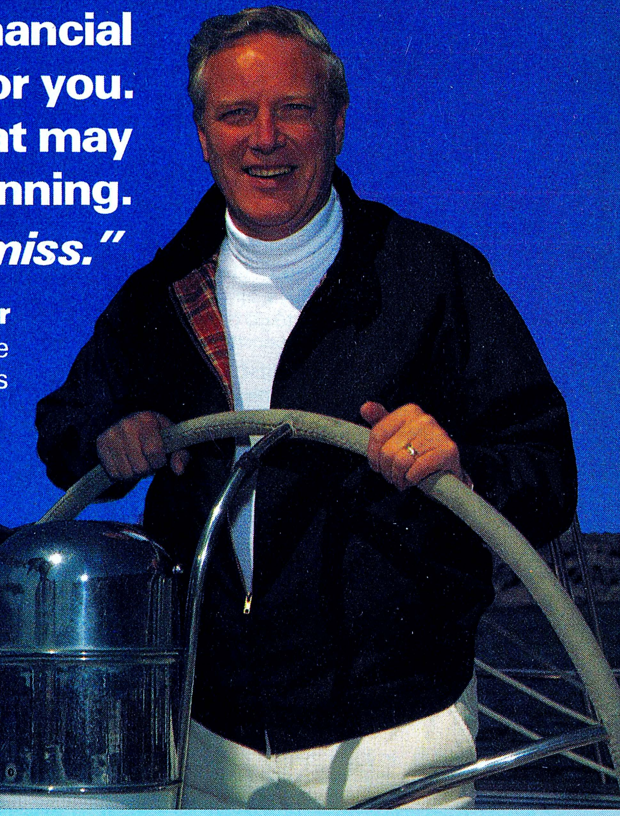

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dBase II adamantly refused to look for its overlays along the path. Other programs will not find any type of files, as we discovered when we tried to use *FilePath* with Oasis Systems's *Punctuation + Style*. The method a program uses for opening files determines whether it will work with *FilePath*.

Although some recently released applications have been programmed to change directories for data files, most PC software doesn't know how, and a path to files has been sorely needed. *FilePath* fills this need. It's extremely valuable for XT or other Winchester disk users and for any other DOS 2.0/2.1 users who want to take full advantage of the directory system for managing their files. Even at the new price of $24.50 (it was introduced at a bargain basement $12.95), *FilePath* is a must for serious PC users.

—*John Dickinson*

FilePath, SDA Associates (Box 36152, San Jose, CA 95158; 408-281-7747). $24.50 plus $2.50 handling (California residents add $1.72 tax).

PFS:Access

PFS:Access is the telecommunications arm of the popular series of applications from Software Publishing Corporation. Its cousins, *PFS:Write*, *PFS:File*, and *PFS:Report*, are the basis for IBM's *Assistant* series. The guiding principles of these packages have been consistency and ease of use. The commands, based on the function keys, have been kept as similar as possible from one package to another so that someone who has mastered, say, *PFS:File* will be able to use *PFS:Report* with little difficulty. *PFS:Access*, happily, continues in this tradition.

The typical user of telecommunications software, the person who wants to use CompuServe or The Source, or maybe call a BBS, wants convenience. He or she doesn't want to fuss with parity or duplex. Simplifying operation without sacrificing performance is a trick balancing act, but *PFS:Access* has done it satisfactorily.

The first step in using any telecommunications package is to configure your software to your hardware. In *PFS:Access*, you do this by selecting "Choose modem" from the program's main menu. The program supports a dozen modem models, including the PC*jr* built-in modem. If yours isn't listed, it's possible that the configuration for one of the supported modems will work. Not all modems fall into this category, however, and it would be a good idea to check with the publisher or try the program out beforehand if your modem isn't officially supported. Even though you might get *PFS:Access* to run with such modems, some of the program's best features may be unavailable to you.

Once you've configured the program to your modem, you're all ready to go. The program is set up to dial CompuServe, Dow Jones, EasyLink, MCI Mail, and The Source. All you need to do is supply the correct phone numbers. If you want to create an automatic sign-on, you simply hit the proper function key (applicable function keys are identified on a line at the bottom of the screen) when you've finished entering the log-on information (password and so on) that the communications service requires. This, incidentally, is a feature that might not work if you have an unsupported modem.

Three blank services have been included that you can set up as whatever you wish—your favorite BBS, the bank, or a friend's computer. And, if you want, you can overwrite the preconfigured services and replace them with your own choices. Thus, if you don't expect to use EasyLink, you could replace it with the phone number of the local Dial-Your-Match. You are limited, however, to eight services on the menu at a time.

Sending and receiving files with *PFS:Access* is as simple as hitting a couple of function keys and providing the program with a filename. A nifty feature is an encryption option that lets you send your messages in what looks like gobbledygook to anyone who doesn't have the correct password for downloading the document. The program process is based on the Data Encryption Standard of the National Bureau of Standards, and, while it might not stump the CIA, it will provide more than enough protection against prying eyes.

Another useful feature is the ability to scroll back and forth through the text of a session by using the page-up, home, end, and page-down keys. This means you can go back and review text that has scrolled off the screen; with many communications packages it would have scrolled off into oblivion.

PFS:Access is not without limitations. You can't instruct it to call up a BBS in the middle of the night without your participation. You can't tell it to dial a number over and over until someone finally answers. For functions such as these, users will have to turn to a more sophisticated package. As its name implies, *PFS:Access* is intended to serve primarily as a means of accessing information services quickly and with a minimum of fuss. The presence of more advanced features would have made the program more difficult to learn and operate.

PFS:Access is copy-protected, but there are provisions for installing it on a hard disk five times and making a single backup of the floppy disk. The documentation is clear and thorough. For the user who is looking primarily for a way to access information services, *PFS:Access* provides plenty of capability without the complications.

—*James Bradbury*

PFS:Access, Software Publishing Corporation (1901 Landings Drive, Mountain View, CA 94043; 415-962-8910). Requires 128K. $95. ▲

MARKETALK NEWS

Δ **Compaq Computer Corporation** (20333 FM 149, Houston, TX 77070; 713-370-7040) has introduced the *Deskpro*, a desktop IBM-compatible machine that uses the 8086 microprocessor. The computer is available in four configurations. The entry-level model includes one floppy disk drive, 128K, and a dual-mode monitor that displays high-resolution text and graphics on the same screen. The top-of-the-line model has 640K, one floppy disk drive, a 10M hard disk, an internal 10M tape backup system, the dual-mode monitor, and an asynchronous communications/clock board. $2,495—$7,195.

Δ **AT&T** (100 Southgate Parkway, Morristown, NJ 07927; 201-898-8000) has announced the *Personal Computer 6300*, an 8086-based machine that operates at 8 MHz. It is available in three configurations: single-floppy, dual-floppy, and hard-disk and floppy. The floppy-disk models come with 128K expandable to 640K. The hard-disk model comes with 256K expandable to 640K. $2,585—$4,920.

Δ **Electronic Systems Engineering** (Box 572 DTS, Portland, ME 04112; 207-773-7778) has announced two products. The *Async Communicator* is a full RS-232 serial asynchronous communications add-on designed for single-user or multiuser applications. It features an I/O port address decoding system that allows any number of serial ports to be added to the computer. $139.50. Δ The *Versaport* parallel adapter is a parallel communications add-on allowing the computer to be interfaced to any type of peripheral capable of communicating via a TTL-compatible parallel interface. It features a 64K-address decoding system for maximum efficiency in the use of the I/O channel. $119.45.

Δ **QED Information Sciences** (Box 181, Wellesley, MA 02181; 617-237-5656) has announced *PCjr PLUS*, an educational course that teaches first-time PC*jr* users how to operate their computers. The course covers hardware, the keyboard, software, storage of records and files, computer terms, and major types of application software. Requires cartridge BASIC. $59.95.

Δ *Mailist*, from **Software Studios** (8516 Sugarbush Court, Annandale, VA 22003; 703-978-3524), is a mailing list maintenance system that features a RAM-resident array for names and addresses that gives quick access when selecting, amending, deleting, and updating data. A letter-writing capability permits merging of names and addresses with letters. $25.

Δ *Trio*, a package designed to eliminate the problem of rekeying data when *1-2-3* is used by corporate PC users to analyze information contained in mainframe-produced reports, has been released by **CDI Systems** (2803 Butterfield, Oak Brook, IL 60521; 312-325-2430). The software allows users to transfer files of data from an IBM mainframe to the PC and back, extract desired information from the transferred data, and convert the data into spreadsheet format. $345. With *1-2-3*, $695.

Δ PCool, from **Analytic Information Processing** (Box 966, Danville, CA 94526; 415-837-2803), is an auxiliary cooling system that drops system unit temperature by an average of fifteen degrees Fahrenheit by providing an intake airflow directly across the expansion cards. No system modifications are required, and the unit can be installed by the user. $99.95.

Δ A networking version of *Metafile* has been announced by **Sensor-Based Systems** (401 Sixteenth Street S.E., Rochester, MN 55904; 507-289-8967). The information-management program allows database information to be shared by concurrent users with transaction-level locking. This lockout feature enables multiple users to share files yet protect data integrity. Additionally, a multiuser option allows multiple users to share system resources. $295.

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"Starting FORTH" Tutorial	$ 16.00

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wood Avenue, Sunnyvale, CA 94089; 408-744-1290) has released *L-Net*, an MS-DOS-based local-area network that extends the company's Diplomat natural language for multiuser use with record and file-level locking capability. The network allows users to link as many as sixty-four microcomputers. File server kits for converting hard disk computers, $1,890. Hardware and software to convert a standalone micro into a workstation, $775 to $1,200. Network repeaters for each 600-foot extension of the data bus, $615.

Δ **ProSoft Systems** (29-14 Twenty-Third Avenue, Long Island City, NY 11105; 212-728-2200) has introduced *Horse Race Handicapper II*, a program that analyzes horseracing data from the *Daily Racing Form*. It is based on a statistical analysis of more than 32,000 races. The algorithm used customizes the analysis for more than 100 tracks nationwide. $49.95.

Δ *Organization Map JR*, from **Pacesetter Software** (Box 5270, Princeton, NJ 08540; 609-737-8351), is designed to assist managers in improving their organizations' productivity and at the same time manage human resources more effectively. It provides a complete description of an organization's structure, including layers of management, spans of control, and staffing levels. It can also present a manager with a detailed view of the work activities taking place within an organization, point out where these activities are taking place, and then calculate their various costs. $895.

Δ *Concurrent PC-DOS,* from **Digital Research** 160 Central Avenue, Pacific Grove, CA 93950; 408-649-3896), is an operating system that can run up to four PC-DOS or CP/M-86 application programs at a time. A communications capability lets users work on one application as the system receives information from an on-line database. The system's windowing capability lets users view the execution of four applications simultaneously. Windows can be positioned anywhere on the screen, scrolled, or sized to part of an application. Requires 256K, two floppy disk drives or one floppy and one hard-disk drive. $295. Δ *Presentation Master* produces high-resolution color slides and prints from computer graphics. The computer image recorder accepts data from the color/graphics card to reproduce each image on film, simultaneously matching or modifying colors to the user's choice from color exposure tables in the software package. Exposed rolls of 35mm film can be processed on the spot and turned into slides or prints in seconds. $1,995.

Δ *G*, from **Micro Marketing Associates** (3497 East Livingston Avenue, Columbus, OH 43227; 614-231-4956), is an interactive graphics editing program that lets the user erase, reposition, copy, mirror, or flip any screen image. It includes functions that fill areas with color, draw geometric shapes, control the cursor's speed and line size, and change drawing palettes and background colors. $95.

Δ **Borland International** (4113 Scotts Valley Drive, Scotts Valley, CA 95066; 408-438-8400) has introduced *Sidekick*, a program that offers a set of integrated, interactive windows that feature an electronic notepad/editor, calculator, appointment calendar, ASCII table, and automatic dialing. The program is written in assembly language and occupies a mere 20K. It can be used while another, unrelated application is running. $49.95.

Δ **Nova Graphics International** (1015 Bee Cave Woods, Austin, TX 78746; 512-327-9300) has announced *NOVA⋆GKS*, a full implementation of the Graphical Kernel System standard. It allows applications to be device-independent and transportable between different types of hardware. Source version, $500. Binary only, $200.

Δ **Esteem Computer Products** (7 Wintonbury Road, Simsbury, CT 06070; 203-658-0230) has released *The Correspondence File System*, designed to emulate the file system preferred by large companies. The program is written in *dBase II*. Requires 128K, two disk drives. $95

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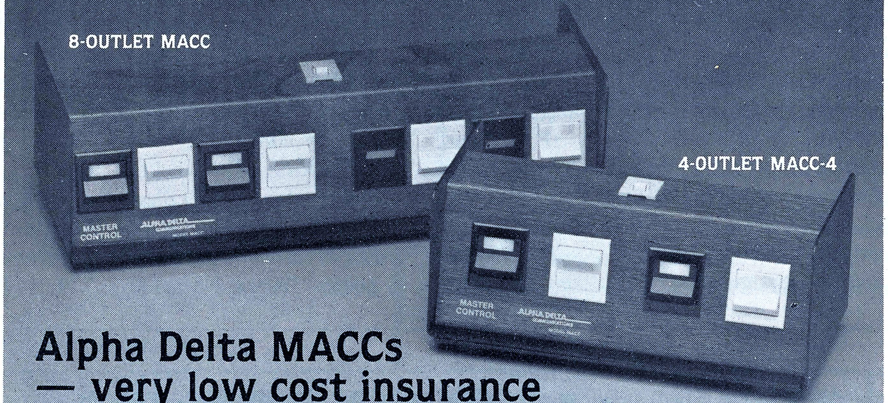

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(requires *dBase II*). With *dBase Runtime*, $225.

Δ *SNA Exchange*, an integrated hardware/software communications package, has been released by **Intelligent Technologies International** (151 University Avenue, Palo Alto, CA 94301; 415-328-2411). The package is designed to offer a link between PCs and IBM mainframes. $895.

Δ The *K-Safeguard* expansion board, from **International Electronic Technology** (1931 Mott Avenue, Far Rockaway, NY 11691; 212-327-1119), prevents unauthorized access to the PC, XT, and compatibles. A set of switches on the the card allows the user to set a code of up to eight digits. The card is then plugged into an expansion slot. Input or withdrawal of data is impossible without entry of the proper code sequence. After six unsuccessful attempts at breaking the code, an alarm sounds for fifteen minutes. $200.

Δ **Riverdale Systems Design** (3333 Henry Hudson Parkway, Riverdale, NY 10463; 212-549-1692) has announced *The Entrepreneur's Financial Workplate*, a set of seven *1-2-3* templates (with worksheets) that assist the entrepreneur or financial manager in the compilation of a strategic business plan. Requires 192K, two disk drives, printer, and *1-2-3*. $69.95.

Δ *Depreciation-Master II*, from **Generic Software** (190 Timber, Marquette, MI 49855; 906-249-9801), provides depreciation figures for capital assets. The program can handle up to three depreciation methods per asset. This provides a way of accounting for federal tax rules, internal book methods, and separate state methods, all within the same asset database file. Requires 96K, two disk drives, and printer. $199.

Δ A coding guide for programming in BASIC has been introduced by **Associated Technology** (Estill Springs, TN 37330; 615-967-9159) to aid software managers who wish to standardize their department coding practices. The forty-two-page guide provides a comprehensive set of company standards and examples of their application. $22.

Δ *Micro Data Analyzer*, from **Cambridge Information International** (238 Main Street, Cambridge, MA 02142; 617-354-0199), is a twelve-program package that does statistical summaries, histograms, plots, cross-tabulation tables, correlation and covariance analysis, and least-squares regression. It also does statistical breakdowns for one or several variables stratified by category groups defined by other variables. The program can read and write DIF files for data transfer from and to *VisiCalc* and *dBase II*. $349.

Δ **Dow Jones Information Services** (Box 300, Princeton, NJ 08540; 609-452-2000) has introduced two products. *Home Budget* is a program designed to help individuals and small businesses create budgets, do financial planning, and prepare taxes. The program uses standard double-entry bookkeeping procedures. It can define up to two hundred accounts and group several together for reporting purposes. The budget's sixty-three codes cut across the accounts and group together certain types of transactions, such as tax-deductible expenses. $139. Δ The *Prospect Organizer* is designed to help sales professionals increase their productivity. It tracks prospects from initial leads through allocation to sales territories. Users can maintain, update, organize, and display prospect files and allocate prospects to sales territories. $395.

Δ *File Search 3*, an information management system that provides quick indexing and retrieval of filed information, has been introduced by **Data Technology Corporation** (2775 Northwestern Parkway, Santa Clara, CA 95051; 408-496-0434). The program features "fuzzy search" and speed. It can find one file out of one thousand in one second on a hard disk. On a floppy, it takes about five seconds. Requires 128K, DOS 2.0. $195.

Δ **Data Translation** (100 Locke Drive, Marlboro, MA 01752; 617-481-3700) has announced *Chromlab*, a chromatography/spectroscopy applications package designed for gas chromatography, high-performance liquid chromatography, UV-visible difference and fluorescence spectroscopy, and thin-layer scanning. $995.

Δ *STC: MultiSolver*, an integrated package of nine business applications, is available from **Software Technology for Computers** (153 California Street, Newton, MA 02158; 617-244-2590). The applications are operated from a master menu and include screen prompts, help screens, and common commands in English. The applications include database management, word processing, spreadsheet, general ledger, mailing list/form letter, checkbook manager, budget manager, bar graphs, and invoicing. Requires 128K, two disk drives. $295.

Δ A program that offers three techniques for automatically creating word and concept indexes for any size document has been introduced by **Emerging Technology Consultants** (2031 Broadway, Boulder, CO 80302; 303-447-9495). *INDIX* operates with word processing software to create a list of words and page numbers formatted by the word processing program. It will operate with any processed document that contains strictly ASCII or extended ASCII characters. Requires 128K. $95.

Δ *APX Core Executive*, from **Application Executive Corporation** (600 Broadway, New York, NY 10012; 212-226-6347), lets the user integrate off-the-shelf applications such as *WordStar* and *1-2-3* without modification. Other features of the software are windows, concurrent processing of up to eight applications, a macro keystroke facility, and data transfer between programs. $195. ▲

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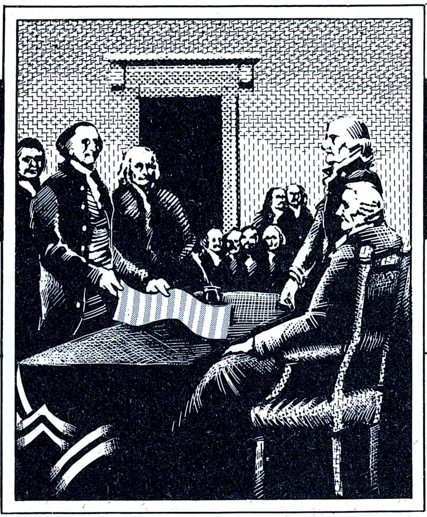

THE RIGHT TO ASSEMBLE

by Ray Duncan

A Tutorial on the Logical Instructions

The logical instructions of the 8088 microprocessor provide bitwise Boolean operations on either byte or word data. These instructions are useful for setting, clearing, testing, and merging bit fields. Like the arithmetic instructions, the logical instructions have the syntax

ins destination,source

where *ins* is one of the instructions AND, OR, XOR, or TEST, or the form

ins destination

if the instruction is NOT.

The destination operand may be either a register or a memory location, and the source operand may be a register or an immediate data value. For most instructions, the result of the instruction replaces the destination operand; the exception is TEST.

Almost all of the logical instructions have effects on the CPU status flags. In general, the Sign, Zero, and Parity flags are set according to the value of the result of the operation; the Carry and Overflow flags are unilaterally cleared. The exception that proves the rule is the NOT instruction, which does not affect any status flags at all.

Detailed Descriptions

AND. The logical AND operation follows these rules for each bit:

0 AND 0 = 0
1 AND 0 = 0
0 AND 1 = 0
1 AND 1 = 1

Thus, a bit will be set in the result only if it is set in both the arguments. As an example, let us assume that AX contains 1234H and BX contains 00F0H. After the operation

AND AX,BX

the AX register will contain 0030H and the BX register will be unchanged. In this fashion, when the separate bits of a byte or word are used as individual flags to conserve memory space, an AND operation is typically employed to isolate and examine subsets of the bits.

OR. The logical OR operation follows these rules for each bit:

0 OR 0 = 0
1 OR 0 = 1
0 OR 1 = 1
1 OR 1 = 1

In other words, a bit will be set in the result if it was set in *either* of the arguments. This operation is sometimes termed an Inclusive OR. For instance, assume that the AX register contains 00FFH and the BX register contains FF00H. After the operation

OR AX,BX

AX will contain FFFFH, and BX will be unchanged.

XOR. A logical XOR (Exclusive OR) operation works on each bit as follows:

0 XOR 0 = 0
1 XOR 0 = 1
0 XOR 1 = 1
1 XOR 1 = 0

Observe that a bit will be set in the result of an XOR operation only if the two argument bits *differed*. XOR is sometimes used for this purpose, but it is more commonly utilized to reverse the state of selected bits. As an example, suppose that register AX contains F000H and register BX contains 800FH. After the operation

XOR AX,BX

AX will hold 700FH, and BX will be unchanged.

NOT. This instruction simply inverts all bits in its operand; that is, it takes the one's complement of its operand.

NOT 1 = 0
NOT 0 = 1

This operation is vital when the two's complements of multiprecision numbers are being calculated (see following examples). Once again, note that NOT is the only logical instruction that doesn't affect the CPU status flags.

TEST. The TEST instruction acts as though an AND has been performed between the source and destination operands, setting the CPU flags accordingly, but it leaves the value of the destination operand unchanged. By performing a TEST and then a conditional branch based on one of the CPU status flags, your program can examine, and act on, the state of one or more bits in a byte or word.

Some Practical Examples

Setting a Register to 0. This is probably the most common use to which any logical instruction on the 8086/88 microprocessor is put. XORing any register with itself sets the contents of that register to 0; for example:

XOR AX,AX

This is equivalent to:

MOV AX,0

but is one byte shorter and one machine cycle faster.

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Isolating Bits. Assume that the lowest four bits of register BX contain an index in the range 0 through 0FH and that the rest of the register contains miscellaneous flag bits. We wish to isolate the four-bit index value so that we can use it to fetch a byte from an array. This may be accomplished by coding:

```
AND  BX,0FH
MOV  AL,BYTE PTR [ARRAY+BX]
```

Setting Bits. Assume that register AX contains a set of flags and register BX contains a bit mask. For every bit that is set in BX, we wish to set the corresponding bit in AX, regardless of its previous state. To do this, we merely write

```
OR  AX,BX
```

The value in BX is unchanged.

Clearing Bits. Assume that register AX contains a set of flags and register BX contains a bit mask. For every bit that is set in BX, we wish to clear (reset) the corresponding bit in AX. This may be done in either of two ways. The first is

```
AND  BX,AX
XOR  AX,BX
```

and the second is

```
NOT  BX
AND  AX,BX
```

The advantage provided by the latter method is that the original contents of BX can be recovered by another NOT BX instruction.

Changing Sign of Value. To change the sign of a binary value on the 8088 microprocessor we simply obtain its two's complement. This is found by inverting all the bits (one's complement) and then adding 1. For example, if we want to change the sign of

0001H

we invert all the bits

FFFEH

then add 1 to get

FFFFH

which is the two's complement representation of −1. The 8088 has a machine instruction NEG to change the sign of sixteen-bit numbers but no equivalent for thirty-two-bit values, so we'll have to cook up our own. Assume that DX contains the upper part and AX contains the lower part of a thirty-two-bit signed value. To change the sign, we code

```
NOT  AX
NOT  DX
ADD  AX,1
ADC  DX,0
```

Testing a Value for 0. This can be done conveniently with the TEST instruction. For example, to check the contents of the variable XYZ for 0, we would write

```
TEST XYZ,-1
JZ   VALUE_IS_ZERO
JMP  VALUE_NOT_ZERO
```

Alternatively, if the destination operand is a register, we can simply OR it with itself, which leaves the destination unchanged but sets the CPU flags appropriately:

```
OR   AX,AX
JZ   VALUE_IS_ZERO
JMP  VALUE_NOT_ZERO
```

The latter method is two cycles faster than using a TEST instruction but has the limitation that it can't be used on memory operands.

Testing Sign of Value. This can be accomplished several different ways, two of which will be described here. The TEST instruction may be applied to check the state of the most significant (sign) bit, but this code always looks a little clumsy:

```
TEST XYZ,-1
JS   VALUE_NEGATIVE
JMP  VALUE_POSITIVE
```

If the destination operand is a register, we can simply OR it with itself, which leaves the destination unchanged but sets the CPU flags appropriately:

```
OR   AX,AX
JS   VALUE_NEGATIVE
JMP  VALUE_POSITIVE
```

This second method is faster and requires less memory.

The FREE Utility

This month's utility program, called FREE, determines the amount of available space on the current or selected disk drive and displays same on the standard output device. You can get the same information by entering a *dir* command, of course, but doing it that way means waiting for all the files in the current subdirectory to be listed out first.

The FREE program is invoked by the command line:

```
A>FREE
```

to display the space available on the "current drive," or

```
A>FREE unit:
```

to display the available room on a selected drive. For example, to see how many bytes are left on drive C:, you would enter

```
A>FREE C:
```

If you select a disk drive that does not exist, you will receive an error message.

Inside the FREE Utility

The FREE program is straightforward, and most of its parts should be self-explanatory to readers who have been following this column. It does, however, incorporate several techniques that have never been covered in this column, and you may wish to add these to your bag of tricks.

In lines 28 through 36, we define a "dummy" segment that corresponds to FREE's Program Segment Prefix (set up by DOS before program execution). By creating labels within this dummy segment, we can assign symbolic names to different parts of the PSP, which are then available to the rest of the program. If you examine the IBM PC's ROM BIOS (refer to the *Technical Reference* manual), you will find some similar code that allows the ROM BIOS's author to directly reference the video buffers and the reserved locations in lower memory.

In line 41, we include

```
ASSUME DS:DSEG
```

with the rest of the segment register ASSUMEs so that assembler "knows" enough to allow the procedure "GET_DRIVE" access to the dummy PSP segment. Later, when we reset the DS register to point to the program's DATA segment, we tell the assembler about it in line 81.

In addition, our program demonstrates the use of two special DOS calls. Function 30H (lines 69 and 70) returns the version number of the operating system that our program is running under. It's a good idea to include a similar sort of version test in your programs if they will be running on an IBM PC and they access the version 2.0 extended "Unix-like" file capabilities. The IBM PC is the only computer running an MS-DOS derivative where version 1.x is still available; as far as we know, all other MS-DOS-based machines (TI, HP, and so on) are currently sold only with MS-DOS version 2.x.

Lines 85 through 100 illustrate the use of function 36H, "Get Free Disk Space". What the function actually returns is a bunch of values

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```
1                                     name    free
2                                     page    60,132
3                                     title   'FREE --- Report free space on disk'
4
5                              ; FREE --- a utility to report free space on
6                              ;          the default or selected disk drive.
7                              ;
8                              ; Requires PC-DOS or MS-DOS 2.0.
9                              ;
10                             ; Used in the form:
11                             ; A> FREE  [unit:]
12                             ; (item in square brackets is optional)
13                             ;
14                             ; version 1.0   July 4, 1984
15                             ; Copyright (c) 1984 by Ray Duncan
16                             ; May be freely reproduced for non-commercial use.
17
18   = 000D                    cr      equ     0dh             ;ASCII carriage return
19   = 000A                    lf      equ     0ah             ;ASCII line feed
20   = 0020                    blank   equ     20h             ;ASCII space code
21   = 0024                    eom     equ     '$'             ;end of string marker
22
23
24                             ; Here we define a dummy segment containing labels
25                             ; for the default file control block and the command tail buffer,
26                             ; so that the main program can access those locations.
27                             ;
28   0000                      psp     segment para public 'PSP'
29
30   005C                              org     05ch
31   005C                      fcb     label   byte            ;default file control block
32
33   0080                              org     080h
34   0080                      command label   byte            ;default command buffer
35
36   0080                      psp     ends
37
38
39   0000                      cseg    segment para public 'CODE'
40
41                                     assume  cs:cseg,ds:psp,es:data,ss:stack
42
43
44   0000                      get_drive proc  near            ;get drive selection, if any,
45                                                             ;otherwise obtain the identity
46                                                             ;of the current disk drive.
```

```
47                                                             ;Return drive (1=A, 2=B, etc) in AL.
48                                                             ;
49   0000  A0 005C R                   mov     al,fcb          ;Pick up the drive code, parsed
50                                                             ;by DOS into the default file
51                                                             ;control block.
52   0003  0A C0                       or      al,al           ;Is it the default?
53   0005  75 06                       jnz     get_drive1      ;no, use it
54   0007  B4 19                       mov     ah,19h          ;Yes, get the actual current
55   0009  CD 21                       int     21h             ;drive from PC-DOS.
56   000B  FE C0                       inc     al              ;Increment to match FCB code.
57   000D                      get_drive1:                     ;Return drive code in AL.
58   000D  C3                          ret
59   000E                      get_drive endp
60
61
62   000E                      free    proc    far             ;entry point from PC-DOS
63
64   000E  1E                          push    ds              ;save DS:0000 for final
65   000F  33 C0                       xor     ax,ax           ;return to PC-DOS
66   0011  50                          push    ax
67   0012  B8  ---- R                  mov     ax,data         ;make our data segment
68   0015  8E C0                       mov     es,ax           ;addressable via ES register.
69   0017  B4 30                       mov     ah,30h          ;check version of PC-DOS.
70   0019  CD 21                       int     21h
71   001B  3C 02                       cmp     al,2
72   001D  73 0A                       jae     free1           ;proceed, DOS 2.0 or greater.
73   001F  BA 004A R                   mov     dx,offset msg2  ;DOS 1.x --- print error message
74   0022  8C C0                       mov     ax,es           ;and exit. First fix up DS register
75   0024  8E D8                       mov     ds,ax           ;so error message is addressable.
76   0026  EB 2C 90                    jmp     free4
77
78   0029  E8 0000 R           free1:  call    get_drive       ;get drive selection into DL.
79   002C  06                          push    es              ;copy ES to DS for remainder
80   002D  1F                          pop     ds              ;of the program...
81                                     assume  ds:data         ;and tell assembler about it.
82   002E  8A D0                       mov     dl,al
83   0030  04 40                       add     al,'A'-1        ;form drive letter from drive code,
84   0032  A2 0021 R                   mov     outputb,al      ;and put it into the output string.
85   0035  B4 36                       mov     ah,36h          ;now call DOS to get free disk space.
86   0037  CD 21                       int     21h
87   0039  3D FFFF                     cmp     ax,-1           ;was drive invalid?
88   003C  74 13                       je      free3           ;yes,go print error message
89                                                             ;drive was ok, so now registers are...
90                                                             ;AX=number of sectors per cluster
91                                                             ;BX=available clusters,
```

extracted from the disk descriptor table; to determine that amount of free space in bytes, you have to perform a couple of multiple operations.

The FREE utility also contains two subroutines of general interest.

BIN—TO—ASC converts a signed, thirty-two-bit binary value to an ASCII string in the desired radix (the radix must be in the range of from 2 through 36). The upper part of the thirty-two value is passed in DX and the lower part in AX; the radix is passed in CX; and SI contains the last byte address of the area to store the converted ASCII string. Make sure that there is enough room to store the converted string (in hex, nine digits; in decimal, ten digits; and in binary, thirty-two digits). To modify this routine to handle unsigned thirty-two-bit values, you'd simply delete lines 129 through 135 and lines 151 through 154.

DIVIDE is a general-purpose thirty-two-bit by sixteen-bit unsigned division subroutine. The thirty-two-bit dividend is passed with the upper part in DX and the lower part in AX; the divisor is passed in CX. The thirty-two-bit quotient is returned in DX:AX, and the remainder in BX. Compare this with the 8088's unsigned DIV machine instruction, which also divides DX:AX by a sixteen-bit value but can only return you a sixteen-bit quotient; this is inadequate for an output conversion routine that must extract digits from a thirty-two-bit argument.

The code for DIVIDE may look a little obscure at first, but it will become clearer if you simply consider each of the registers (DX, AX, and CX) as a single digit. Then, you'll find that it's exactly like normal long division done by hand:

1. The first digit of the dividend is divided by the divisor.

2. The quotient from step 1 becomes the first digit of the final thirty-two-bit quotient.

3. The second digit of the original dividend is appended to the remainder from step 1.

4. The thirty-two-bit value obtained from step 3 is divided by the original divisor.

5. The quotient from step 4 becomes the second digit of the final thirty-two-bit quotient.

6. The remainder from step 4 is the final remainder. Pretty simple, but not very obvious from the machine code.

Access to Source Code

Remember, readers who subscribe to CompuServe can download the source code for the FREE utility (and most of the programs previously published in this column) from the IBM PC Special Interest Group database. Enter GO PCS-131 at the first ! prompt, then XA 4 to gain access to the database. ▲

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```
                                                 ;CX=number of bytes per sector,
                                                 ;DX=total clusters per drive.
                                                 ;calculate free space:
003E  F7 E1                   mul     cx         ;sectors per cluster * bytes per sector
                                                 ;(we assume this won't overflow into DX)
0040  F7 E3                   mul     bx         ;then * available clusters

                                                 ;DX:AX now contains free space in bytes.
                                                 ;SI = last byte address for converted string.
0042  BE 000B R               mov     si,offset (outputa+9)
0045  B9 000A                 mov     cx,10      ;CX = 10, radix for conversion
0048  E8 0059 R               call    bin_to_asc ;convert free space value to ASCII,
004B  BA 0000 R               mov     dx,offset output
004E  EB 04 90                jmp     free4      ;and print it out.

0051  BA 0026 R       free3:  mov     dx,offset msg1  ;illegal drive, print error

0054  B4 09           free4:  mov     ah,9       ;print the string whose address
0056  CD 21                   int     21h        ;is in DX.
0058  CB                      ret                ;then return to DOS.

0059                  free    endp


                      ; Convert 32 bit binary value to ASCII string.
                      ;
                      ; Call with  DX:AX = signed 32 bit value
                      ;            CX    = radix
                      ;            SI    = last byte of area to store resulting string
                      ;                    (make sure enough room is available to store
                      ;                     the string in the radix you have selected.)
                      ;
                      ; Destroys AX, BX, CX, DX, and SI.
                      ;
0059                  bin_to_asc proc near       ;convert DX:AX to ASCII.
                                                 ;force storage of at least 1 digit.
0059  C6 04 30                mov     byte ptr [si],'0'
005C  0B D2                   or      dx,dx      ;test sign of 32 bit value,
005E  9C                      pushf              ;and save sign on stack.
005F  79 0A                   jns     bin1       ;jump if it was positive.
0061  F7 D2                   not     dx         ;it was negative, take 2's complement
0063  F7 D0                   not     ax         ;of the value.
0065  05 0001                 add     ax,1
0068  83 D2 00                adc     dx,0
006B                  bin1:                      ;divide the 32 bit value by the radix
                                                 ;to extract the next digit for the
                                                 ;forming string.
006B  8B D8                   mov     bx,ax      ;is the value zero yet?
006D  0B DA                   or      bx,dx
006F  74 13                   jz      bin3       ;yes, we are done converting.
0071  E8 008B R               call    divide     ;no, divide by radix.
0074  80 C3 30                add     bl,'0'     ;convert the remainder to an ASCII digit.
0077  80 FB 39                cmp     bl,'9'     ;we might be converting to hex ASCII,
007A  7E 03                   jle     bin2       ;jump if in range 0-9,
007C  80 C3 07                add     bl,'A'-'9'-1   ;correct it if in range A-F.
007F  88 1C           bin2:   mov     [si],bl    ;store this character into string.
0081  4E                      dec     si         ;back up through string,
0082  EB E7                   jmp     bin1       ;and do it again.
0084                  bin3:                      ;restore sign flag,
0084  9D                      popf               ;was original value negative?
0085  79 03                   jns     bin4       ;no, jump
                                                 ;yes,store sign into output string.
0087  C6 04 2D                mov     byte ptr [si],'-'
008A  C3              bin4:   ret                ;back to caller.
008B                  bin_to_asc endp


                      ; General purpose 32 bit by 16 bit unsigned divide.
                      ; This must be used instead of the plain machine unsigned divide
                      ; for cases where the quotient may overflow 16 bits (for example,
                      ; dividing 100,000 by 2).  If called with a zero divisor, this
                      ; routine returns the dividend unchanged and gives no warning.
                      ;
                      ; Call with DX:AX = 32 bit dividend
                      ;           CX    = divisor
                      ;
                      ; Returns   DX:AX = quotient
                      ;           BX    = remainder
                      ;           CX    = divisor (unchanged)
                      ;
008B                  divide  proc    near       ; Divide DX:AX by CX
008B  E3 0E                   jcxz    div1       ; exit if divide by zero
008D  50                      push    ax         ; 0:dividend_upper/divisor
008E  8B C2                   mov     ax,dx
0090  33 D2                   xor     dx,dx
0092  F7 F1                   div     cx
0094  8B D8                   mov     bx,ax      ; BX = quotient1
0096  58                      pop     ax         ; remainder1:dividend_lower/divisor
0097  F7 F1                   div     cx
0099  87 DA                   xchg    bx,dx      ; DX:AX = quotient1:quotient2
009B  C3              div1:   ret                ; BX = remainder2
009C                  divide  endp

009C                  cseg    ends


0000                  data    segment para public 'DATA'

0000  0D 0A           output          db      cr,lf
0002     0A [         outputa         db      10 dup (blank)
               20
                  ]

000C  20 62 79 74 65 73               db      ' bytes free on drive '
      20 66 72 65 65 20
      6F 6E 20 64 72 69
      76 65 20
0021  78 3A 0D 0A 24  outputb         db      'x:',cr,lf,eom

0026  0D 0A           msg1            db      cr,lf
0028  54 68 61 74 20 64               db      'That disk drive does not exist.'
      69 73 6B 20 64 72
      69 76 65 20 64 6F
      65 73 20 6E 6F 74
      20 65 78 69 73 74
      2E
0047  0D 0A 24                        db      cr,lf,eom

004A  0D 0A           msg2            db      cr,lf
004C  52 65 71 75 69 72               db      'Requires DOS version 2 or greater.'
      65 73 20 44 4F 53
      20 76 65 72 73 69
      6F 6E 20 32 20 6F
      72 20 67 72 65 61
      74 65 72 2E
006E  0D 0A 24                        db      cr,lf,eom

0071                  data    ends


0000                  stack   segment para stack 'STACK'
0000     40 [                 db      64 dup (?)
               ??
                  ]

0040                  stack   ends

                              end     free
```

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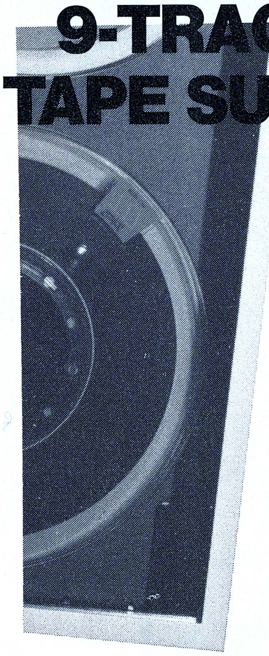

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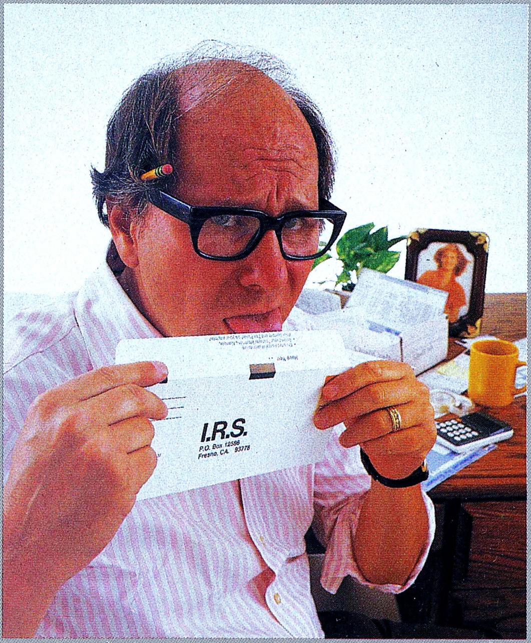

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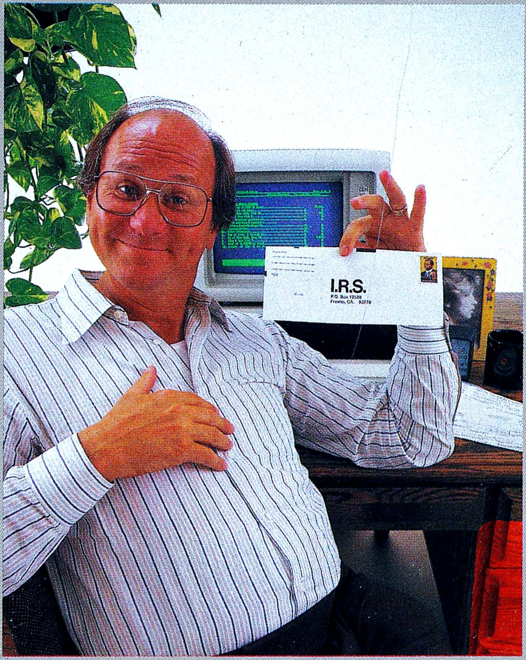

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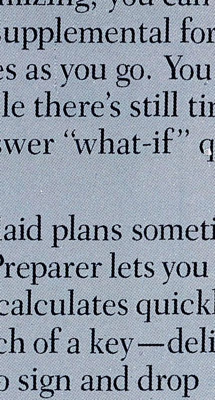

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SOFTALK PRESENTS THE BESTSELLERS

There seems to be nothing in this world so complex that it can't get even more muddled.

Take the world of politics. Just when it was beginning to look like President Reagan was a shoo-in bet for reelection, he managed to appoint a previously discredited member of his administration to a top advisory panel, thereby alienating huge numbers of folks concerned about the environment.

Clearly, this left Walter Mondale at a distinct disadvantage. After all, he's never had an administration from which to draw previously discredited people. Faced with the perhaps awesome possibility of gaining ground on Reagan, Mondale did what he could: He took a previously discredited member of Carter's administration and named him to the post of national campaign chairman.

It often seems as though both candidates, already sufficiently scarred in the feet, have taken aim squarely between the eyes.

There are times when it seems that the leaders of some software companies are taking their cues directly from our not-so-astute political leaders.

For example, suppose you have the runaway bestseller in the market. Of course, you start working on enhancements to maintain your position. But do you start announcing them several months prior to availability?

Mitch Kapor of Lotus did. The predictable result of the early announcement of *Symphony* was a postponement of many buying decisions relative to *1-2-3*. Now that sufficient information about *Symphony* is available, the flood tide of *1-2-3* buyers has resumed.

Not to be outdone, the good folks at Ashton-Tate announced that they were working on two new products, *dBase III* and *Framework*. It made a lot of sense for them to reveal the imminence of *Framework*, because it's a direct competitor of *Symphony*'s and noncompetitive with the present Ashton-Tate product line. Not so with *dBase III*.

Again, the results were predictable. Some microcomputer owners have been postponing buying decisions relative to *dBase II* and *Friday!* while awaiting word on *dBase III*. The result is that *dBase II* dropped from second to third in sales in June and *Friday!* plummeted off the list. The drastic drop-off in *Friday!* sales was unexpected, in that Ashton-Tate and most of their dealers have been conscientious, and apparently successful, in staking out a separate beginner's market for *Friday!*. The success of that marketing stratagem must now be viewed with some skepticism in light of the impact that *dBase III*'s announcement seems to be having.

For all the troubles that these market leaders seem to be facing, their turmoil must seem trivial to those who are competing in the word processing market, where the companies would probably gladly settle for an environment that was only muddled instead of totally chaotic.

MultiMate seems now to be the target, having seized that role from *WordStar*. Not only is *MultiMate* consolidating its lead over the several strong programs in the field, it has moved up to fourth overall among the bestsellers.

Moving up from fifth in the genre to become the main competitor was *PFS:Write*. But the unsettled nature of this market segment was underscored by the arrival of *HomeWord*. Another in the mode of simple-to-use word processors—this one aimed at the PC*jr*—*HomeWord* jumped to twenty-first in the poll and third among word processors,

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just edging out Microsoft's *Word*. *WordPerfect* was a few notches lower.

Dropping still further down was *WordStar*, in one of those perverse occurrences that make one speculate on the existence of a deity or on the validity of the laws of Isaac Newton. MicroPro's latest version of *WordStar* has received unanimously excellent reviews concurrent with its current drop in market share. Earlier, the product was holding its own while being the recipient of brickbats from every corner.

Adding to the confusion was the reemergence of *WordPlus-PC*. Formerly *WordStar*'s chief competitor, it got lost in the shuffle of new word processing products some months ago and was lost from sight. Now, with the addition of the *BOSS* spelling checker, it seems to be regaining much ground.

Not far out of the Top Thirty was another oldie but goodie, *EasyWriter II*.

The influence of Junior on software sales continues to grow. *Dollars and Sense* and *Home Accountant Plus* both jumped on the strength of additional home sales, and the Zork trilogy continues stronger now that Junior is putting the IBM logo in more homes. ▲

IBM-franchised retail stores representing approximately 4.91 percent of all sales of IBM and IBM-related Personal Computer products volunteered to participate in the poll.

Respondents were contacted early in July to ascertain their sales for the month of June.

The only criterion for inclusion on the list was the number of units sold; such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in July represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 3.71 percent, which translates roughly into the theoretical possibility of a change of 3.92 points, plus or minus, in any index number.

TOP THIRTY

This Month	Last Month	Index	
1	1	447.27	**1-2-3**, Mitch Kapor and Jonathan Sachs; Lotus Development
2	3	97.63	**Microsoft Flight Simulator**, Bruce Artwick; Microsoft
3	2	67.23	**dBase II**, Wayne Ratliff; Ashton-Tate
4	7	53.20	**MultiMate**; MultiMate International
5	4	49.11	**Copy II Plus**; Central Point Software
6	5	40.34	**PFS:File**, John Page and D.D. Roberts; Software Publishing Corporation
7	6	36.24	**Crosstalk**; Microstuf
8	8	33.32	**MasterType**, Bruce Zweig; Scarborough Systems
9	18	28.06	**Dollars and Sense**, Frank E. Mullin; Monogram
10	21	26.31	**Home Accountant Plus**, Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Arrays/Continental Software
11	16	25.14	**Sideways**; Funk Software
12	17	24.55	**PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell; Software Publishing Corporation
13	11	23.97	**Multiplan**; Microsoft
14	13	23.38	**Harvard Project Manager**; Harvard Systems
15	10	23.32	**Norton Utilities**, Peter Norton; Peter Norton Inc.
16	22	21.04	**Zork I**; Infocom
17	28	18.70	**Barron's SAT**; Barron's
18	20	16.95	**PFS:Report**, John Page; Software Publishing Corporation
19	25	16.37	**Basic Compiler**, Microsoft; IBM
20	29	14.03	**Zork III**; Infocom
21	—	12.86	**HomeWord**, Ken Williams and Jeff Stephenson; IBM (Sierra)
22	9	12.80	**Word**; Microsoft
23	30	12.27	**Zork II**; Infocom
24	15	11.87	**WordPerfect**, Alan Ashton and Bruce Bastian; Satellite Software
25	27	11.81	**R:Base 4000**; Microrim
26	12	11.69	**WordStar**; MicroPro
27	24	11.40	**Asynchronous Communications Support 2.0**; IBM
28	19	11.34	**Wizardry**, Andrew Greenberg and Robert Woodhead; Sir-tech
29	14	11.10	**Typing Tutor**, Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
30	—	10.51	**WordPlus-PC**, Andres Escallon, Professional Software

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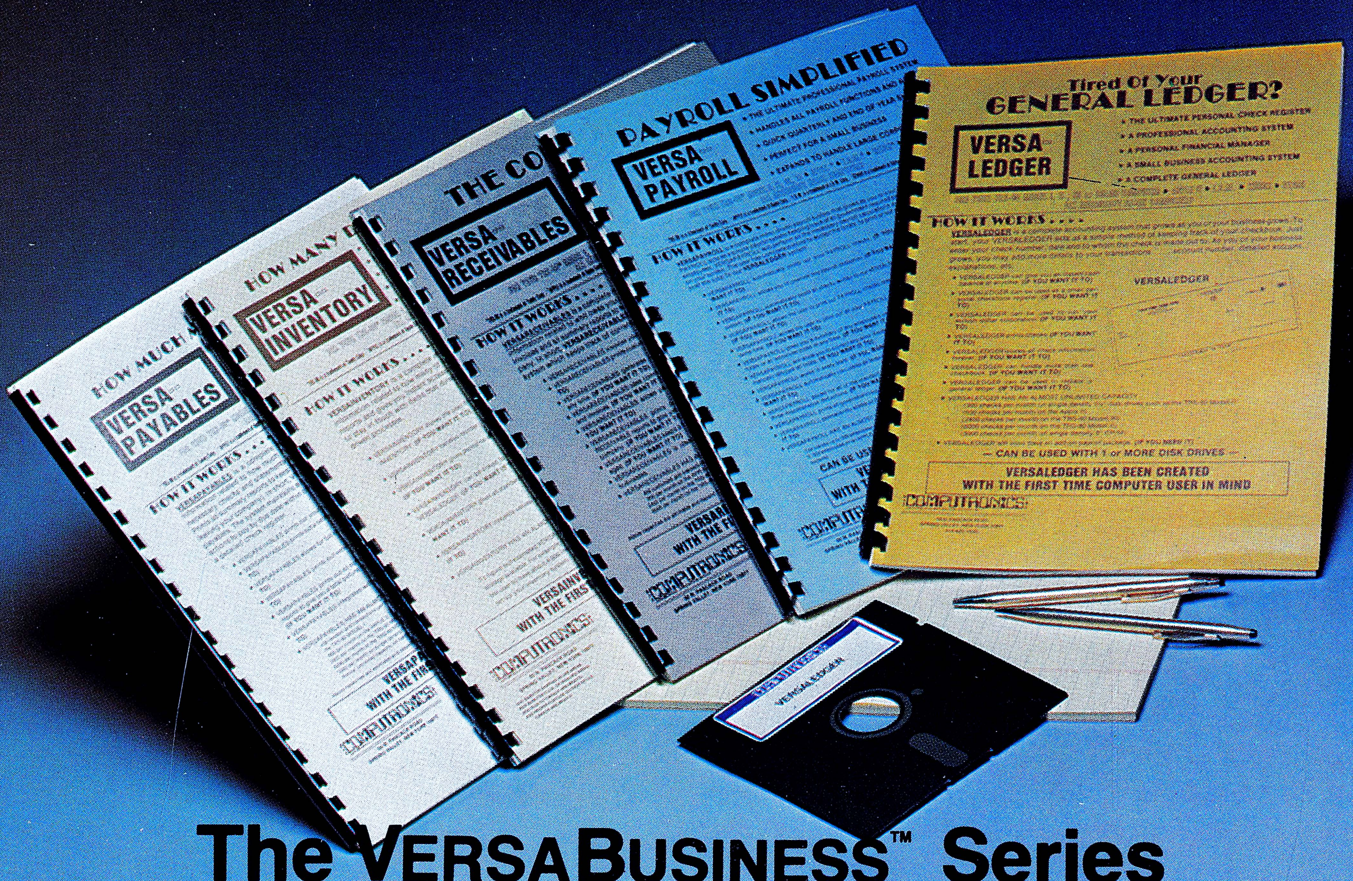
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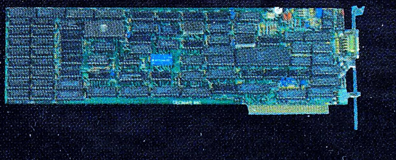

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